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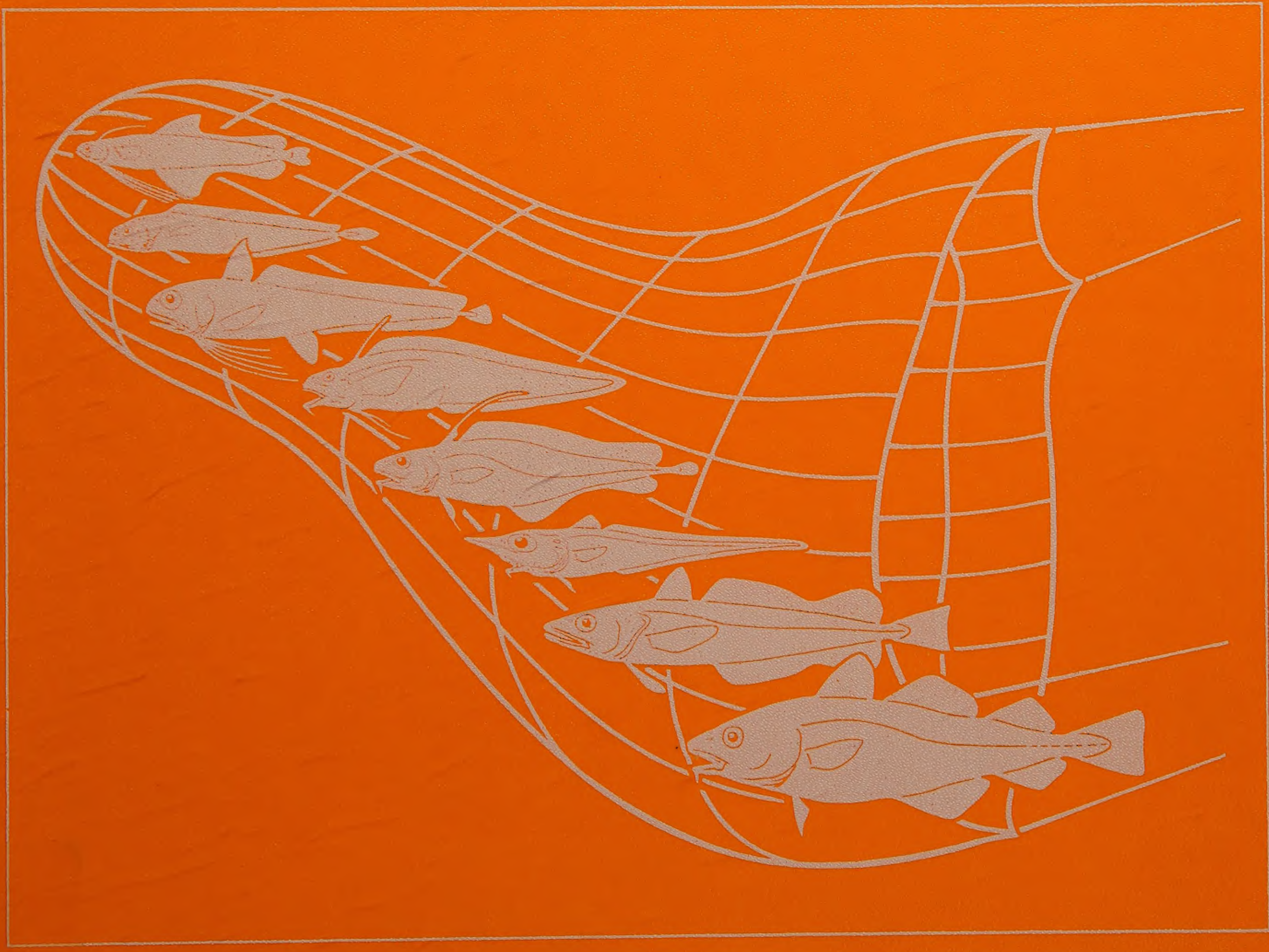
FAO SPECIES CATALOGUE

VOL. 10. GADIFORM FISHES OF THE WORLD
(Order GADIFORMES)

AN ANNOTATED AND ILLUSTRATED CATALOGUE
OF CODS, HAKES, GRENADIERS AND OTHER
GADIFORM FISHES KNOWN TO DATE



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VOL.10 GADIFORM FISHES OF THE WORLD

(Order Gadiformes)

An Annotated and Illustrated Catalogue of Cods, Hakes, Grenadiers and other Gadiform Fishes Known to Date

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PREPARATION OF THIS DOCUMENT

Since the Gadiformes include some of the world's most important commercial fish species, plans for the present catalogue were conceived many years ago. However, because of the confused state of the higher systematics of this complex and highly polymorphic group of fishes, the large number of poorly known species in some gadiform families, and the wealth of information on habitat and fisheries available on others, the original draft manuscript prepared in 1985 had to be substantially revised several times. Even in its present stage it does not reflect the latest findings in both the fields of taxonomy and fisheries. Nevertheless, it represents an up-to-date inventory of the species considered to be of present or potential interest to fisheries and is expected to become an important reference source for fishery workers throughout the world.

The 3 ichthyologists who have prepared the basic manuscript of the catalogue are internationally recognized experts in their respective fields and have been collaborating with the FAO Species Identification and Data Programme for many years.

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ABSTRACT

This is the tenth issue in the FAO series of worldwide annotated and illustrated catalogues (synopses) of major groups of organisms that enter marine fisheries. It includes all gadiform fishes (order GADIFORMES - cods, hakes, grenadiers, moras, moray cods, pelagic cods, codlets and eucla cods), comprising 8 families, 59 genera and more than 180 species, which contribute more than a quarter of the world's marine fish catch. Keys are given to the families, subfamilies and genera, with a glossary of technical terms and measurements, and a review of major literature sources within each FAO fishing area. Genera and species are diagnosed, with drawings, scientific and vernacular names, information on habitat, biology, fisheries and distribution (with map); reference is also made to subspecies and to any taxonomic or other problems. The occurrence of the species within the FAO fishing areas is tabulated. All scientific names still applied to gadiform species are given in the synonymies, and these as well as the vernacular names are indexed; there is also a complete bibliography of all literature cited.

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TABLE OF CONTENTS

Page

1. INTRODUCTION 1

1.1 General Remarks on Gadiformes 1
1.2 Information on Fisheries 4
1.3 Plan of the Systematic Catalogue 6
1.4 Problems with Identification 7
1.5 Illustrated Glossary of Technical Terms and Measurements 9

2. SYSTEMATIC CATALOGUE OF SPECIES 13

2.1 Key to Families 13

Code

2.2 FAMILY BREGMACEROTIDAE BREG 16

Genus *Bregmaceros* BREG Breg 16
Tentative list of species 16
Bregmaceros sp. BREG Breg 1 17

2.3 FAMILY EUCLICHTHYIDAE EUCL 18

2.4 FAMILY GADIDAE GADI 18

Key to genera 20

Genus *Arctogadus* GADI Arc 25
Key to species 25
Arctogadus borisovi GADI Arc 1 25
Arctogadus glacialis GADI Arc 2 26

Genus *Boreogadus* GADI Bor 27
Boreogadus saida GADI Bor 1 27

Genus *Brosme* GADI Bro 29
Brosme brosme GADI Bro 1 29

Genus *Ciliata* GADI Cil 31
Key to species 31
Ciliata mustela GADI Cil 1 32
Ciliata septentrionalis GADI Cil 2 33

Genus *Eleginus* GADI Ele 33
Key to species 34
Eleginus gracilis GADI Ele 1 34
Eleginus navaga GADI Ele 2 36

Genus *Enchelyopus* GADI En 38
Enchelyopus cimbrius GADI En 1 38

Genus *Gadiculus* GADI Gadi 39
Gadiculus argenteus GADI Gadi 1 39

Genus ***Gadus***	GADI Gadu	41
Key to species		41
Gadus macrocephalus	GADI Gadu 1	42
Gadus morhua	GADI Gadu 2	44
Gadus ogac	GADI Gadu 3	47
Genus ***Gaidropsarus***	GADI Gaidr	48
Tentative list of species		49
Gaidropsarus biscayensis	GADI Gaidr 3	49
Gaidropsarus macrophthalmus	GADI Gaidr 4	50
Gaidropsarus mediterraneus	GADI Gaidr 1	50
Gaidropsarus vulgaris	GADI Gaidr 2	51
Genus ***Lota***	GADI Lota	52
Lota lota	GADI Lota 1	53
Genus ***Melanogrammus***	GADI Mela	54
Melanogrammus aeglefinus	GADI Mela 1	54
Genus ***Merlangius***	GADI Merla	55
Merlangius merlangus	GADI Merla 1	56
Genus ***Microgadus***	GADI Micro	57
Key to species		57
Microgadus proximus	GADI Micro 1	58
Microgadus tomcod	GADI Micro 2	58
Genus ***Micromesistius***	GADI Microm	60
Key to species		60
Micromesistius australis	GADI Microm 2	60
Micromesistius poutassou	GADI Microm 1	61
Genus ***Molva***	GADI Molv	63
Key to species		63
Molva dypterygia	GADI Molv 1	63
Molva molva	GADI Molv 2	64
Genus ***Phycis***	GADI Phyc	65
Key to species		66
Phycis blennoides	GADI Phyc 1	66
Phycis chesteri	GADI Phyc 3	67
Phycis phycis	GADI Phyc 2	68
Genus ***Pollachius***	GADI Pol	69
Key to species		70
Pollachius pollachius	GADI Pol 1	70
Pollachius virens	GADI Pol 2	71
Genus ***Raniceps***	GADI Ran	73
Raniceps raninus	GADI Ran 1	73
Genus ***Theragra***	GADI Ther	74
Key to species		74
Theragra chalcogramma	GADI Ther 1	75
Theragra finnmarchica	GADI Ther 2	76
Genus ***Trisopterus***	GADI Triso	77
Key to species		77
Trisopterus esmarkii	GADI Triso 3	77
Trisopterus luscus	GADI Triso 2	79
Trisopterus minutus	GADI Triso 1	80

Genus ***Urophycis*** .... GADI Uroph 81
Key to species 81
Urophycis brasiliensis .... GADI Uroph 3 82
Urophycis chuss .... GADI Uroph 4 83
Urophycis cirrata .... GADI Uroph 5 85
Urophycis earlii .... GADI Uroph 6 85
Urophycis floridana .... GADI Uroph 1 86
Urophycis regia .... GADI Uroph 2 87
Urophycis tenuis .... GADI Uroph 7 88

2.5 FAMILY MACROURIDAE .... MACROUR 90

Key to Subfamilies 91

Subfamily **Bathygadinae** 92

Key to genera 93

Genus ***Bathygadus*** .... MACROUR Bath 93
List of species 94
Bathygadus macrops .... MACROUR Bath 1 94
Bathygadus melanobranchus .... MACROUR Bath 2 95

Genus ***Gadomus*** .... MACROUR Gado 96
List of species 97
Gadomus arcuatus .... MACROUR Gado 1 97

Subfamily **Macrourinae** 98

Key to genera 99

Genus ***Albatrossia*** .... MACROUR Alb 110
Albatrossia pectoralis .... MACROUR Alb 1 110

Genus ***Coelorinchus*** .... MACROUR Coel 111
Key to species 112
List of species 137
Coelorinchus acanthiger .... MACROUR Coel 4 139
Coelorinchus aconcagua .... MACROUR Coel 5 140
Coelorinchus anatirostris .... MACROUR Coel 6 141
Coelorinchus argentatus .... MACROUR Coel 7 142
Coelorinchus argus .... MACROUR Coel 8 144
Coelorinchus aspercephalus .... MACROUR Coel 9 145
Coelorinchus australis .... MACROUR Coel 10 146
Coelorinchus biclinozonalis .... MACROUR Coel 11 147
Coelorinchus braueri .... MACROUR Coel 12 149
Coelorinchus canus .... MACROUR Coel 13 150
Coelorinchus caribbaeus .... MACROUR Coel 14 151
Coelorinchus chilensis .... MACROUR Coel 15 152
Coelorinchus coelorhincus .... MACROUR Coel 1 154
Coelorinchus denticulatus .... MACROUR Coel 16 155
Coelorinchus fasciatus .... MACROUR Coel 2 156
Coelorinchus formosanus .... MACROUR Coel 17 158
Coelorinchus hexfasciatus .... MACROUR Coel 18 159
Coelorinchus innotabilis .... MACROUR Coel 19 161
Coelorinchus japonicus .... MACROUR Coel 20 162
Coelorinchus kaiyomaru .... MACROUR Coel 21 163
Coelorinchus kamoharai .... MACROUR Coel 22 164
Coelorinchus karrerae .... MACROUR Coel 23 166
Coelorinchus kishinouyei .... MACROUR Coel 24 167
Coelorinchus labiatus .... MACROUR Coel 25 168

Coelorinchus longicephalus .... MACROUR Coel 26 .. 169
Coelorinchus macrochir .... MACROUR Coel 27 .. 171
Coelorinchus marinii .... MACROUR Coel 3 ... 172
Coelorinchus matamua .... MACROUR Coel 28 .. 173
Coelorinchus multispinulosus .... MACROUR Coel 29 .. 174
Coelorinchus occa .... MACROUR Coel 30 .. 176
Coelorinchus oliverianus .... MACROUR Coel 31 .. 177
Coelorinchus parallelus .... MACROUR Coel 32 .. 178
Coelorinchus productus .... MACROUR Coel 33 .. 179
Coelorinchus scaphopsis .... MACROUR Coel 34 .. 181
Coelorinchus ventrilux .... MACROUR Coel 35 .. 182

Genus ***Coryphaenoides*** .... MACROUR Cory 183
Key to species 183
List of species 201
Coryphaenoides acrolepis .... MACROUR Cory 1 ... 202
Coryphaenoides anguliceps .... MACROUR Cory 2 ... 203
Coryphaenoides ariommus .... MACROUR Cory 3 ... 204
Coryphaenoides armatus .... MACROUR Cory 4 ... 205
Coryphaenoides carminifer .... MACROUR Cory 5 ... 206
Coryphaenoides cinereus .... MACROUR Cory 6 ... 207
Coryphaenoides delsolari .... MACROUR Cory 7 ... 209
Coryphaenoides guentheri .... MACROUR Cory 8 ... 210
Coryphaenoides longifilis .... MACROUR Cory 9 ... 211
Coryphaenoides macrocephalus .... MACROUR Cory 10 .. 212
Coryphaenoides marginatus .... MACROUR Cory 11 .. 214
Coryphaenoides mexicanus .... MACROUR Cory 12 .. 215
Coryphaenoides nasutus .... MACROUR Cory 13 .. 216
Coryphaenoides rupestris .... MACROUR Cory 14 .. 217
Coryphaenoides serrulatus .... MACROUR Cory 15 .. 219
Coryphaenoides subserrulatus .... MACROUR Cory 16 .. 220
Coryphaenoides zaniophorus .... MACROUR Cory 17 .. 221

Genus ***Cynomacrurus*** .... MACROUR Cyno 223
Cynomacrurus piriei .... MACROUR Cyno 1 ... 223

Genus ***Hymenocephalus*** .... MACROUR Hym 224
Key to species 225
List of species 230
Hymenocephalus italicus .... MACROUR Hym 1 ... 230

Genus ***Lepidorhynchus*** .... MACROUR Lep 231
Lepidorhynchus denticulatus .... MACROUR Lep 1 232

Genus ***Macrourus*** .... MACROUR Macr 233
Key to species 234
List of species 234
Macrourus berglax .... MACROUR Macr 1 ... 235
Macrourus carinatus .... MACROUR Macr 2 ... 236
Macrourus holotrachys .... MACROUR Macr 3 ... 237
Macrourus whitsoni .... MACROUR Macr 4 ... 238

Genus ***Malacocephalus*** .... MACROUR Mal 240
Key to species 240
List of species 241
Malacocephalus laevis .... MACROUR Mal 1 242
Malacocephalus occidentalis .... MACROUR Mal 2 243

Genus ***Mataeocephalus*** .... MACROUR Mat 244
Key to species 244
List of species 245
Mataeocephalus acipenserinus .... MACROUR Mat 1 246
Mataeocephalus tenuicauda .... MACROUR Mat 2 247

Genus ***Nezumia*** .... MACROUR Nez 248
  Key to ***Nezumia*** groups 248
  Key to species of ***Nezumia*** by groups 249
  List of species 263
  Nezumia aequalis .... MACROUR Nez 1 264
  Nezumia atlantica .... MACROUR Nez 2 265
  Nezumia bairdi .... MACROUR Nez 3 266
  Nezumia brevibarbata .... MACROUR Nez 4 267
  Nezumia condylura .... MACROUR Nez 5 269
  Nezumia convergens .... MACROUR Nez 6 270
  Nezumia duodecim .... MACROUR Nez 7 271
  Nezumia latirostrata .... MACROUR Nez 8 272
  Nezumia liolepis .... MACROUR Nez 9 274
  Nezumia loricata .... MACROUR Nez 10 ... 275
  Nezumia micronychodon .... MACROUR Nez 11 ... 276
  Nezumia milleri .... MACROUR Nez 12 ... 278
  Nezumia orbitalis .... MACROUR Nez 13 ... 279
  Nezumia propinqua .... MACROUR Nez 14 ... 280
  Nezumia proxima .... MACROUR Nez 15 ... 281
  Nezumia pudens .... MACROUR Nez 16 ... 282
  Nezumia pulchella .... MACROUR Nez 17 ... 283
  Nezumia sclerorhynchus .... MACROUR Nez 18 ... 284
  Nezumia stelgidolepis .... MACROUR Nez 19 ... 286

Genus ***Sphagemacrurus*** .... MACROUR Spha 287
  Key to species 287
  List of species 288
  Sphagemacrurus grenadae .... MACROUR Spha 1 ... 289

Genus ***Trachonurus*** .... MACROUR Tra 290
  Tentative list of species 290
  Trachonurus sulcatus .... MACROUR Tra 1 290

Genus ***Ventrifossa*** .... MACROUR Vent 292
  Key to adults of genus 292
  List of species 296
  Ventrifossa atherodon .... MACROUR Vent 1 ... 296
  Ventrifossa ctenomelas .... MACROUR Vent 2 ... 297
  Ventrifossa divergens .... MACROUR Vent 3 ... 299
  Ventrifossa garmani .... MACROUR Vent 4 ... 300
  Ventrifossa macropogon .... MACROUR Vent 5 ... 301
  Ventrifossa macroptera .... MACROUR Vent 6 ... 303
  Ventrifossa misakia .... MACROUR Vent 7 ... 304
  Ventrifossa mucocephalus .... MACROUR Vent 8 ... 305
  Ventrifossa nasuta .... MACROUR Vent 9 ... 306
  Ventrifossa nigrodorsalis .... MACROUR Vent 10 .. 307
  Ventrifossa nigromaculata .... MACROUR Vent 11 .. 309
  Ventrifossa petersoni .... MACROUR Vent 12 .. 310

Subfamily Macrouroidinae 311
  Key to genera 312

Subfamily Trachyrhyncinae 312
  Key to genera 313
  List of species 313

Genus ***Trachyrincus*** .... MACROUR Tra 313
  Key to species 314
  Trachyrincus helolepis .... MACROUR Tra 2 315
  Trachyrincus scabrus .... MACROUR Tra 1 316
  Trachyrincus villegai .... MACROUR Tra 3 317

2.6 FAMILY MELANONIDAE ..... MELAN 318

Genus ***Melanonus*** ..... MELAN Melan 318

2.7 FAMILY MERLUCCIIDAE ..... MERLU 319

Key to genera 320

Genus ***Lyconus*** ..... MERLU Lyco 322
List of species 322

Genus ***Macruronus*** ..... MERLU Macru 322
Key to species 323
List of species 323
Macruronus capensis ..... MERLU Macru 1 324
Macruronus magellanicus ..... MERLU Macru 2 325
Macruronus novaezelandiae ..... MERLU Macru 3 326

Genus ***Merluccius*** ..... MERLU Merlu 327
Key to species 328
List of species 330
Merluccius albidus ..... MERLU Merlu 2 330
Merluccius angustimanus ..... MERLU Merlu 5 331
Merluccius australis ..... MERLU Merlu 6 332
Merluccius bilinearis ..... MERLU Merlu 7 334
Merluccius capensis ..... MERLU Merlu 8 335
Merluccius gayi ..... MERLU Merlu 9 336
Merluccius hubbsi ..... MERLU Merlu 10 337
Merluccius merluccius ..... MERLU Merlu 1 339
Merluccius paradoxus ..... MERLU Merlu 11 340
Merluccius polli ..... MERLU Merlu 4 341
Merluccius productus ..... MERLU Merlu 12 342
Merluccius senegalensis ..... MERLU Merlu 3 343

Genus ***Steindachneria*** ..... MERLU Stein 345
Steindachneria argentea ..... MERLU Stein 1 345

2.8 FAMILY MORIDAE ..... MOR 346

Key to genera 347
Tentative list of genera 351

Genus ***Antimora*** ..... MOR Ant 352
Key to species 352
Antimora microlepis ..... MOR Ant 2 353
Antimora rostrata ..... MOR Ant 1 354

Genus ***Auchenoceros*** ..... MOR Auch 355
Auchenoceros punctatus ..... MOR Auch 1 355

Genus ***Austrophycis*** ..... MOR Aust 356
Austrophycis marginata ..... MOR Aust 1 356

Genus ***Eeyorius*** ..... MOR Eey 357
Eeyorius hutchinsi ..... MOR Eey 1 357

Genus ***Gadella*** ..... MOR Gadel 358
List of species 358
Gadella imberbis ..... MOR Gadel 1 358
Gadella maraldi ..... MOR Gadel 2 359

Genus ***Halargyreus*** MOR Hal 360
  Halargyreus johnsonii MOR Hal 1 360

Genus ***Laemonema*** MOR Laem 361
  List of species 361
  Laemonema laureysi MOR Laem 1 362
  Laemonema longipes MOR Laem 2 363

Genus ***Lepidion*** MOR Lep 363
  Tentative list of species 364
  Lepidion ensiferus MOR Lep 1 364
  Lepidion eques MOR Lep 2 365
  Lepidion lepidion MOR Lep 3 366

Genus ***Lotella*** MOR Lot 367

Genus ***Momonatira*** MOR Mom 368
  List of species 368

Genus ***Mora*** MOR Mor 369
  Mora moro MOR Mor 1 369

Genus ***Physiculus*** MOR Phys 370
  Tentative list of species 370
  Physiculus dalwigkii MOR Phys 1 371
  Physiculus japonicus MOR Phys 2 372

Genus ***Pseudophycis*** MOR Pseud 373
  Key to species 373
  Pseudophycis bachus MOR Pseud 1 373
  Pseudophycis barbata MOR Pseud 2 374
  Pseudophycis breviuscula MOR Pseud 3 375

Genus ***Salilota*** MOR Sal 376
  Salilota australis MOR Sal 1 377

Genus ***Tripterophycis*** MOR Tript 378
  List of species 378
  Key to species 378
  Tripterophycis gilchristi MOR Tript 1 378

2.9 FAMILY MURAENOLEPIDIDAE MURAENOL 380

Genus ***Muraenolepis*** MURAENOL Mur 380
  Key to species 380
  List of species 381
  Muraenolepis marmoratus MURAENOL Mur 1 381
  Muraenolepis microcephalus MURAENOL Mur 2 382
  Muraenolepis microps MURAENOL Mur 3 383
  Muraenolepis orangiensis MURAENOL Mur 4 384

3. LIST OF SPECIES BY MAJOR FISHING AREAS 385

4. BIBLIOGRAPHY 399

5. INDEX OF SCIENTIFIC AND VERNACULAR NAMES 420

1. INTRODUCTION

The purposes of this catalogue are to provide a convenient means for the identification of gadiform species most likely to be encountered by fishery workers, to summarize fisheries, distributional, and other biological information, to guide users to the most relevant literature and to illustrate the wide diversity of this important group of fishes. It does not purport to present a definitive classification of the order at this stage.

This catalogue includes accounts of all species of gadiform fishes of present interest for fisheries, including those used for human consumption, for animal food, or for industrial purposes; abundant species of present minimal fisheries importance, which may have resource potential with the introduction of improved fishing or processing techniques or with the expansion of fishing areas; and species that are exemplary of various deep-sea or rare genera. In all, accounts are presented for 184 species of the approximately 500 placed by ichthyologists in the order Gadiformes. Although keys include nearly every recognizable gadiform genus and all genera in the keys are illustrated, full accounts of some genera and many species are excluded from this work. More than half of all gadiform species live in the deep sea beyond commercial fishing depth; many are small or are apparently rare in nature, are widely dispersed, or are problematically known taxonomically.

Much of the information here included has been selectively compiled from the literature. Taxonomic descriptions and keys have been verified to the extent possible, using both preserved museum and, for some, freshly caught specimens.

The treatment of the various families in this catalogue is necessarily somewhat unbalanced, as a result of the numerous gaps in the knowledge of many of the genera, of the need to concentrate mainly on species of value to fisheries, and of the fact that the material was prepared by three different authors.

1.1 General Remarks on Gadiformes

In this catalogue, the order Gadiformes is restricted to the cods, hakes, grenadiers, and their more immediate relatives as indicated by Nelson (1984). An expanded order Gadiformes, including the ophidioids (cusk eels, brotulas, and relatives), and in some instances the zoarcoids (eelpouts) has been proposed by many ichthyologists (see for example, Rosen & Patterson, 1969). As here treated, the order comprises eight families.

It is both astonishing and unfortunate that neither external nor internal characters can be listed that uniquely define the order Gadiformes. Descriptions have been written (for example, Marshall & Cohen, 1973; Nelson, 1984) which apply to virtually all species that are generally accepted as belonging to the order, but all of the descriptive characters are not unique to all of the included species. The assignment to the order of many species is presently as much a matter of ichthyological convention as it is a result of logic.

The above situation is bad enough; however, gadiform taxonomy suffers from additional weaknesses. There is no great measure of agreement with respect to the hierarchical arrangement of genera into suborders, families and subfamilies. The problem of classification within the gadiforms is presently a topic of intensive investigation by ichthyologists, and the absence of a consensus has been documented by a number of systematists in a recent publication (Cohen, 1989). Because the present work is not concerned with phylogeny, an alphabetical arrangement is followed, suborders are not considered, and the number of families recognized is to a large degree conservative and arbitrary.

Families and genera

The **Family Bregmacerotidae** contains a single genus, easily recognized by a distinctive fin pattern of a single long ray on the back of the head, bilobed dorsal and anal fins, and long, free pelvic rays. It includes a dozen or more species of small, pelagic fishes found in tropical seas, ranging from close-to-shore to mid-ocean waters. Some species are locally abundant.

The **Family Euclichthyidae** includes a single species trawled from the temperate waters of New Zealand and Australia. It is an interesting fish to the taxonomist, as it does not fit the definition of any gadiform family and recently has been accorded one of its own. Its nearest relatives may be the morids or the macrourids. ***Euclichthys*** is of little interest to the fishery biologist as it does not seem to be abundant enough to support a fishery.

ORDER	FAMILY	SUB-FAMILY	GENUS
GADIFORMES	BREGMACEROTIDAE (15)		*Bregmaceros* (15)
	EUCLICHTHYIDAE (1)		*Euclichthys* (1)
	GADIDAE (53)	Gadinae (22)	*Arctogadus* (2), *Boreogadus* (1), *Eleginus* (2), *Gadiculus* (1), *Gadus* (3), *Melanogrammus*(1), *Merlangius* (1), *Microgadus* (2), *Micromesistius* (2), *Pollachius* (2), *Theragra* (2), *Trisopterus* (3)
		Lotinae (4)	*Brosme* (1), *Lota* (1), *Molva* (2)
		Phycinae (27)	*Ciliata* (2), *Enchelyopus* (1), *Gaidropsarus* (13), *Phycis* (3), *Raniceps* (1), *Urophycis* (7)
	MACROURIDAE (>289)	Bathygadinae (25)	*Bathygadus* (14), *Gadomus* (11)
		Macrourinae (>257)	*Albatrossia* (1), *Coelorinchus* (>76), *Coryphaenoides* (61), *Cynomacrurus* (1), *Hymenocephalus* (21), *Lepidorhynchus* (1), *Macrourus* (4), *Malacocephalus* (7), *Mataeocephalus* (5), *Nezumia* (46), *Sphagemacrurus* (6), *Trachonurus* (6), *Ventrifossa* (22)
		Macrouroidinae (2)	*Macrouroides* (1), *Squalogadus* (1)
		Trachyrincinae (5)	*Idiolophorhynchus* (1), *Trachyrincus* (4)
	MELANONIDAE (2)		*Melanonus* (2)
	MERLUCCIIDAE (19)	Merluccinae (18)	*Lyconus* (2), *Macruronus* (3), *Merluccius* (13)
		Steindachneriinae (1)	*Steindachneria* (1)
	MORIDAE (89)		*Antimora* (2), *Auchenoceros* (1), *Austrophycis*(1), *Eeyorius* (1), *Eretmophorus* (?), *Gadella* (8), *Halargyreus* (1), *Laemonema* (18), *Lepidion* (9), *Lotella* (4), *Momonatira* (2), *Mora* (1), *Paralaemonema* (3), *Physiculus* (31), *Pseudophycis* (3), *Rhynchogadus* (?), *Salilota* (2), *Tripterophycis* (2)
	MURAENOLEPIDIDAE (4)		*Muraenolepis* (4)

Fig.1 Arrangement of Gadiformes followed in this catalogue. Entries under each taxonomic category are alphabetical. Figures in brackets refer to the number of species.

The **Family Gadidae** is a diverse assemblage of about 50 species, many of which have been known since the time of Linnaeus or earlier. Even so, ichthylogists cannot agree on their classification. Most of these fishes live on continental shelves around the North Atlantic, but a few are found in deeper waters, are pelagic, or are caught in other areas, and one, ***Lota***, is a fresh-water fish. Gadids are divided into three subfamilies that are rather different from each other. The subfamily Gadinae with 22 species divided into 12 genera is characterized by having three dorsal fins and two anal fins. It includes some of the most abundant and important fishes in the sea, the true cods, genus ***Gadus***, the haddock, ***Melanogrammus***, and the Alaska pollock, ***Theragra***. The subfamily Lotinae, with four species including the cusk and ling, in three genera, are long-bodied fishes with one or two dorsal fins and a single anal fin. There are two dozen or more species in the subfamily Phycinae, including the rocklings and the non- ***Merluccius*** hakes, divided into six genera in the present arrangement.

The **Family Macrouridae** is sometimes divided into two or more families. It is here treated as one, on a rather arbitrary basis. The grenadier family is the largest one in the Gadiformes, with over 300 species classified in 34 genera, which are here arranged in four subfamilies. Virtually all grenadiers live on or near the bottom in deep water, although a few are pelagic. All macrourids have long tapering tails (hence the widely used name rattails), and all but a very few lack any vestige of a caudal fin. The subfamily Bathygadinae has 25 species in two genera, which are externally characterized by having a large terminal mouth. In nearly all other grenadiers, in contrast, the mouth is located on the undersurface of the head and the snout protrudes beyond the front of the upper jaws. The subfamily Macrourinae is the largest one in the order, and in fact contains more species than all other gadiforms combined. Macrourines are easily enough recognized in having the rays of the long-based second dorsal fin shorter than the rays of the anal fin. The subfamily Macrouroidinae, sometimes considered to be a separate family, has two species, each in a separate genus, with but a single dorsal fin and a greatly inflated head. The subfamily Trachyrincinae has four or five species in two genera, which have a long flattened snout, rough scales and short rays in the first dorsal fin.

The **Family Melanonidae** consists of a single genus and two species of dark-coloured, oceanic, meso- to bathypelagic fishes with a very slender caudal peduncle and distinctive nerve-end organs on the head. They are small and not abundant.

The **Family Merlucciidae** is variously considered a separate family or a subfamily of Gadidae. Aside from the 13 species of hakes and whitings of the genus ***Merluccius***, fishes with a prominent tail fin, a capacious mouth, two dorsal fins, the second bilobed, and a single bilobed anal fin, there is no great measure of agreement about the assignment of other genera to the family (or subfamily). Three other genera are here grouped with ***Merluccius***, and because all of them have long tapering tails and lack a tail fin, all have at one time or another been classified among the grenadiers of the family Macrouridae. ***Macruronus***, living only in the Southern Hemisphere, most resembles ***Merluccius*** in many anatomical characters, and two of the three named ***Macruronus*** species are like many of the ***Merluccius*** species in being large enough and sufficiently abundant to support fisheries. The oceanic genus ***Lyconus*** is rare, with an unknown taxonomy; it contains two or more species. ***Steindachneria,*** which has also been classified by some authors in its own family, has a single small locally abundant species which is found only on the continental slopes of the Gulf of Mexico and Caribbean.

The **Family Moridae** includes about 100 species, most of which are poorly known and there is not even substantial agreement as to how many genera should be recognized in this family. They are relatively elongate fishes, many with a narrow caudal peduncle, and with a distinct caudal fin. Many species have soft flesh, occur in rather deep waters, and do not form large aggregations, and hence they are probably of less potential value to fisheries than either Gadidae, Merlucciidae or Macrouridae.

The **Family Muraenolepididae** consists of a single genus containing an unknown number of species, perhaps a half dozen, of which 4 have been described to-date. They live in far southern seas, mainly around Antarctica, and are rarely encountered. Muraenolepidids have the dorsal, anal, and caudal fins all joined, and the elongated body scales arranged at oblique angles to each other.

Developmental stages

The eggs and larvae of gadiform fishes are a source of information useful for the study of population dynamics and systematics. Considerable information is available for some species. However, the taxonomy of the early life history stages of gadiforms is known for fewer than a third of the species. A comprehensive summary, including extensive literature citations, is presented for gadiforms in general by Fahay & Markle (1984), according to whom, "The gut of gadiform larvae coils early in ontogeny and, combined with a tapering postanal region and rounded head, contributes to an overall tadpole-like appearance. Although it has not been documented in all families and is not always easily observed, yolk-sac and first-feeding gadiform larvae have an anus that exits laterally through the finfold rather than medially as is usual in teleost larvae. Some secondary caudal rays develop before some primary in forms with a caudal fin. A rather widespread trend is for the pelvic fin to be the earliest forming fin.

There does not seem to be any character unique or diagnostic for young gadiforms. The features of body shape, anus morphology and pelvic fin development in combination with specific familial characters appear to be the most useful for initial identification. Transformation is gradual and direct with no striking change in morphology." The development of species of the Family Gadidae is treated by Dunn & Matarese (1984), and by Dunn (1989) and that of bregmacerotids by Houde (1984). Representative gadiform larvae are shown in Fig. 2.

Geographical distribution

The distribution of gadiforms has been discussed by Marshall & Cohen (1973), from which the following account is paraphrased and amended. Although gadiforms are found throughout the world ocean and also in fresh water, they are predominantly marine benthopelagic fishes of cool waters, be they shallow in high and mid-latitudes or deep in the tropics. It is obvious that historical events as well as temperature have shaped present-day distribution patterns of gadiform fishes, as many patterns are characteristic for particular taxonomic categories.

The dozen or more species of Bregmacerotidae are all pelagic in the tropics. Some are mesopelagic and thus live in cool water, but others are found in warm, shallow, coastal seas and are the only truly warm-water gadoids known. The taxonomy of the species is not well enough studied to describe their distributions.

The single species in the family Euclichthyidae is restricted to New Zealand and southern and western Australia.

The Family Macrouridae has the most species of any gadiform family, and many of them have restricted ranges; although deeper dwelling ones seem to be more widely distributed. Even though most kinds of grenadiers live on tropical continental slopes where they may be very abundant, fewer of their distinctive eggs and young than might be expected are found in the plankton. There are several centres of endemism for macrourids, for example the Gulf of Mexico and Caribbean, the Hawaiian Islands, and the Sulu Sea. A few species of grenadiers live in far northern seas (e.g. ***Coryphaenoides rupestris, C. longifilis*** and ***Macrourus berglax***), a few in the Southern Ocean (e.g. ***Macrourus holotrachys, M. whitsoni*** and ***Coryphaenoides lecointei)***, and others are pelagic, but in general, macrourids keep their noses to the tropical bottom.

The Gadidae proper is virtually unique among fish families in having its headquarters on the continental shelf of the temperate North Atlantic (Svetovidov, 1956), a region and habitat with a fish fauna comprised chiefly of the tag ends of groups having their main centres of diversity farther to the south or in the temperate North Pacific. Gadid diversions such as those of ***Lota*** into fresh water, and a few species of ***Gadus, Microgadus, Theragra***, and ***Eleginus*** into the Pacific derive from Atlantic or Arctic sources. Only a few gadids live in the southern hemisphere; the pelagic genus ***Micromesistus*** is antitropical as is the rockling genus ***Gaidropsarus***. Species of the hake genus, ***Urophycis***, found along the coasts of the western Atlantic from Canada to Argentina apparently live in deeper water throughout the tropics.

The family Melanonidae has but a single genus with two species, both meso- to bathypelagic; one of them ***Melanonus gracilis***, is restricted to temperate and subantarctic latitudes.

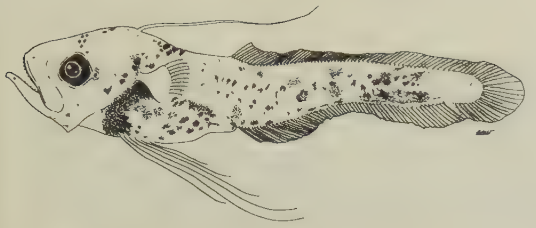
The Family Merlucciidae displays tropical submergence in the genus ***Merluccius*** and a south temperate distribution in the related genus ***Macruronus***. ***Steindachneria***, with a single species, is found only in the tropical and subtropical western North Atlantic.

The Family Moridae is found chiefly on continental slopes in the tropics, where ***Physiculus*** and ***Laemonema*** are the largest genera. A few morids of the genera ***Antimora, Lepidion*** and perhaps ***Physiculus*** have reached abyssal depths, and a sizable number of species is found at New Zealand, where morids live in habitats ranging from nearshore to the deep sea (Paulin, 1983). Morids are also found along the continental slopes of temperate southern South America and South Africa.

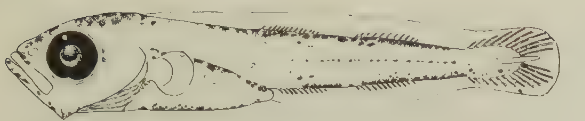
The Muraenolepididae, with only a few described species, is found in far southern seas around Antarctica or some of its cold water island outliers.

1.2 Information on Fisheries

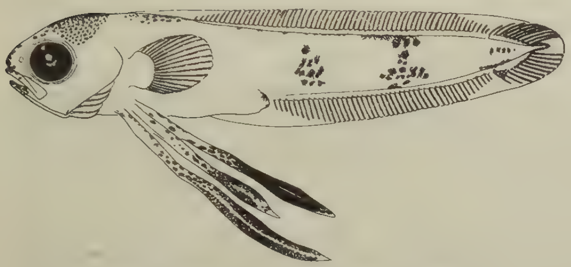
Most gadiforms are benthopelagic and are taken in bottom trawls. A number of species (especially in the families Gadidae and Merlucciidae) are the object of very large, directed fisheries that have been operating since the last century. Others (especially many species in the family Macrouridae) have become accessible to fisheries only in the course of the last few decades and are not yet fully exploited.



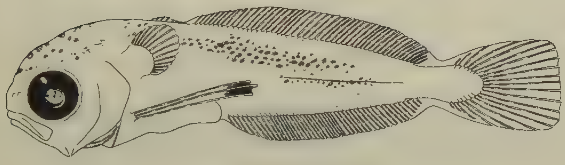
a. Family **Bregmacerotidae**,
Bregmaceros mcclellandi, 7.0 mm



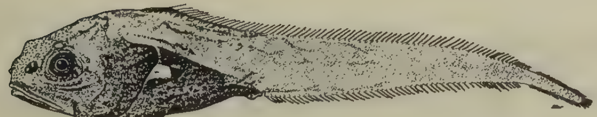
b. Family **Gadidae**, subfamily **Gadinae**,
Gadus morhua, 11.0 mm



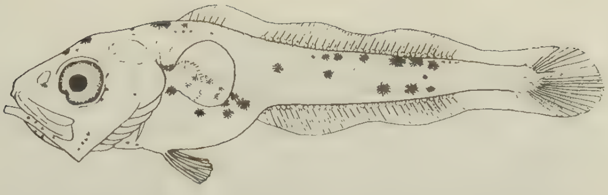
c. Family **Gadidae**, subfamily **Lotinae**,
Brosme brosme



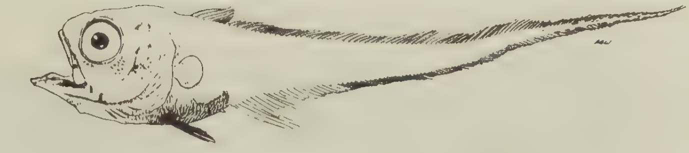
d. Family **Gadidae**, subfamily **Phycinae**,
Urophycis chuss, 9.5 mm



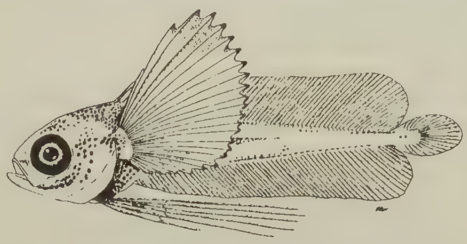
e. Family **Melanonidae**, ***Melanonus*** sp., 30.6 mm



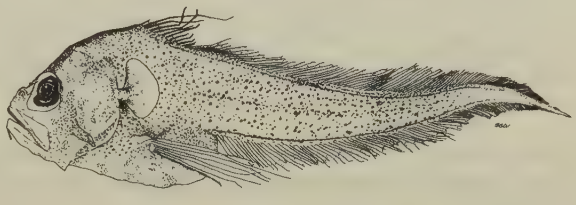
f. Family **Merlucciidae**, subfamily **Merlucciinae**,
Merluccius productus, 10.1 mm



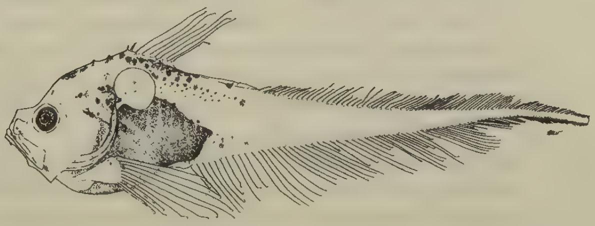
g. Family **Merlucciidae**, subfamly **Steindachneriinae**,
Steindachneria argentea, 24 mm



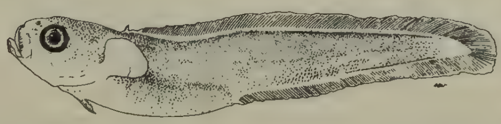
h. Family **Moridae**, ***Gadella maraldi***, 18.8 mm



i Family **Macrouridae**, subfamily **Bathygadinae**,
Gadomus sp., 30 mm



j. Family **Macrouridae**, subfamily **Macrourinae**,
Coryphaenoides sp., 30 mm



k. Family **Muraenolepididae**, ***Muraenolepis*** sp, 32.5 mm

Fig. 2 Examples of larval stages of gadiform fishes. From Moser et al., 1984

The global catch of Gadiform fishes (ca. 13 700 000 metric tons in 1987) represents about 17% of the total world landings from marine waters (80 500 000 t in 1987). Over 95% of these landings correspond to a single family, the cods or Gadidae (ca 11 700 000 t in 1987), followed by the hakes or Merlucciidae (ca. 1 900 000 t), the grenadier fishes or Macrouridae (51 000 t), the moras or Moridae (ca. 20 000 t) and the codlets or Bregmacerotidae (ca. 2 000 t). These catches provene mostly from temperate waters of both hemispheres, i.e. fishing area 61, N.W. Pacific (5 300 000 t), 27, N.E. Atlantic (3 600 000 t), 21, N.W. Atlantic (800 000 t), 41, S.W. Atlantic (700 000 t), 81, S.W. Pacific (200 000 t), and 87, S.E. Pacific (200 000 t). More detailed information is given under the respective families.

1.3 Plan of the Systematic Catalogue

Eight gadiform families are presented: Bregmacerotidae, Euclichthyidae, Gadidae, Macrouridae, Melanonidae, Merlucciidae, Moridae and Muraenolepididae. For each family are given general descriptive remarks, notes on biology and fisheries, and a key to the subfamilies and/or genera. Families and genera, and species within them, are arranged alphabetically. For each genus treated, a brief diagnosis is given, which supplements the data in the key; also included are references to junior synonyms (some of which may still be in current use or entrenched in the older literature), notes on biology and fisheries, a key to species where possible, a list of species, remarks on particular taxonomic problems, and literature. The information given for each species is arranged in the following paragraphs:

(1) **Scientific Name** : Reference is given to the first valid name applied to the species and its accompanying description. Earlier but invalid names appear under synonyms (where necessary).

(2) **Synonyms** : All names that have been applied to the species are given, as well as some different name combinations (if significant) with author and date. The complete synonymies (i.e. all references in the literature) of some gadiform species are enormous and no purpose would be served in citing them in full; in any case, there is often grave doubt whether the material studied was really identified correctly.

(3) **FAO Names** : For many species, only English names have been chosen for use within FAO and to serve as the recommended names for fishery, marketing and other purposes. Some French and Spanish equivalent names for gadiform fishes already used on FAO Identification Sheets, are also included. It is considered premature to attempt this for all species until fishery workers and other specialists in countries using French and Spanish can be consulted.

(4) **Diagnostic Features** : Distinctive features are given, accompanied where necessary by diagrams, as an aid to identifying species within a genus (after using the keys to families, subfamilies and genera).

(5) **Geographical Distribution** : The general range of the species is given in the text and in the map (areas between scattered records may merit a question mark if a continuous range seems doubtful). Distributions plotted on the maps are rough and usually based on the filling in of areas between scattered capture points. In many instances, the distributions shown extend well beyond actual capture localities and are "expected" distributions based on knowledge of the group and on the topography and oceanography of the area. No attempt was made to precisely follow depth contours, although it is recognized that the benthic species in particular occur along relatively restricted isobaths.

(6) **Habitat and Biology** : The true identity of many species is often in doubt, especially in the older literature, so that much apparently useful biological information has had to be omitted here. For very many of the species, however, almost nothing is known of feeding habits, spawning seasons and migrations,.etc.

(7) **Size** : The maximum known size and where possible, the common adult size are given (as total length in centimetres, when not otherwise stated).

(8) **Interest to Fisheries** : Partly based on the statistics by species and by Fishing Area given in the FAO Yearbook of Fishery Statistics for 1987. Since only a few gadiform species (39 out of over 500 described species) are given individual statistics, and since identifications are sometimes doubtful (i.e. more than one species probably included), only a general impression of the relative importance of a species is possible in many cases. However, from fisheries literature for particular areas or particular species considerable information on fisheries is available and has been used. Also, any information on possible fisheries potential of the species has been included.

(9) **Local Names** : These are only occasionally given, usually when a particular species is the basis for a major fishery and its identity is certain. In very many cases, however, a local name is applied to several species and means no more than that the fish is a kind of cod, hake or grenadier.

(10) **Literature** : Reference is made to the most important (not only taxonomic) books or papers on the species, with a brief indication of their relevance in parentheses.

(11) **Remarks** : Taxonomic or other problems are outlined here, e.g. explanations for unexpected name changes, doubtful status of species, indications of further work in progress or needed, and presence of subspecies (which are given a brief diagnosis and geographical range).

1.4 Problems with Identification

It is not always easy to identify a fish as a gadiform or to classify it in a family, genus or species. Some of the most important diagnostic characters are internal. Examples are the shapes and positions of various bones, the shape of the swimbladder and some of its parts, and the shape and number of vertebrae; examining these kinds of characters may require skilled dissection or the use of x-ray photographs. Other characters, although not strictly internal as they are not technically in the body, are in the mouth or gill cavity. Examples are the location, size and shape of teeth or patches of teeth, and the number and size of the gill rakers; accurate identification may require focused light used with a microscope or hand-lens. Obtaining information from completely external characters may also present problems. Ascertaining the number of dorsal and anal fins may seem simple; however, for many genera care must be exercised as the prominent fin lobes of some genera, for example ***Merluccius*** and ***Mora***, are separated by very short rays and the lobes may appear to be separate fins; in genera such as ***Trisopterus*** and ***Molva*** fins that are structurally separate are immediately adjacent at their bases and may appear to be lobes of a single fin. Fins may be covered with thick, pigmented skin so that dissection or x-ray photographs are required in order to obtain precise counts of rays. Many gadiforms have minute scales and in those species for which scale counts are required for identification, it may be necessary to use a lens. The same equipment may be needed to investigate the presence or absence of head pores. In order to accurately count the branchiostegal rays it may be necessary to manipulate the cheek flap in order to spread out the branchial membrane that connects the rays. Although the keys have been designed to use as few as possible of these difficult characters, their total exclusion has not been possible in many instances. A final difficulty in identifying these fishes results from poorly known taxonomy. Many of the species included in the catalogue could not be examined personally by the authors who, in such cases, had to rely on incomplete or inadequate descriptions and illustrations from the literature. This applies particularly to some of the keys and descriptions in the family Macrouridae (see page 90 for further details). No matter how expert the identifier or how much equipment is available, unanswered questions of taxonomy, which exist at all levels of classification among the gadiforms, will prevent accurate identification.

All of the above notwithstanding, the best method of identification is to look at the illustrations, most of which have been drafted to emphasize diagnostic features. Check distributions to see if the illustration that resembles your specimen is of a species that lives where your specimen has been caught. Then check the written section on **Diagnostic Features**, and finally, try to key out your specimen.

Acknowledgements

For help with New Zealand gadiforms I thank Dr J.A.F. Garrick, Mr Peter McMillan, Mr Chris Paulin and Dr. Don Robertson. In Australia I was assisted by Dr John Paxton and Mr Ken Graham in Sydney, Dr. Peter Last in Hobart, Dr. Martin Gomon in Melbourne and Dr. Mike Walker in Pert. Dr P.A. Hulley provided information in South Africa. In addition, Mr Roberto Melendez advised on ***Laemonema,*** Mr Chris Paulin provided help with morids in general, and Dr Richard Miller reviewed the section on Muraenolepididae.This work was started while I worked in the Fish Division of the Smithsonian Institution as a staff member of the US National Marine Fisheries Service; it was completed at the Natural History Museum of Los Angeles County. I thank all three institutions for valued support.

In addition I am grateful to FAO for funds that facilitated visits to museums in New Zealand, Australia and South Africa, as well as to FAO HQ in Rome. I particularly thank Dr W. Fischer and other FAO personnel who assisted my work.

D.M. Cohen

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Dr Nick Sinclair of the Western Australian Museum, Australia for the loan of specimen. Dr Daniel Cohen of the Los Angeles County Museum, USA and Dr Walter Fischer of FAO, Rome kindly looked over my manuscript.

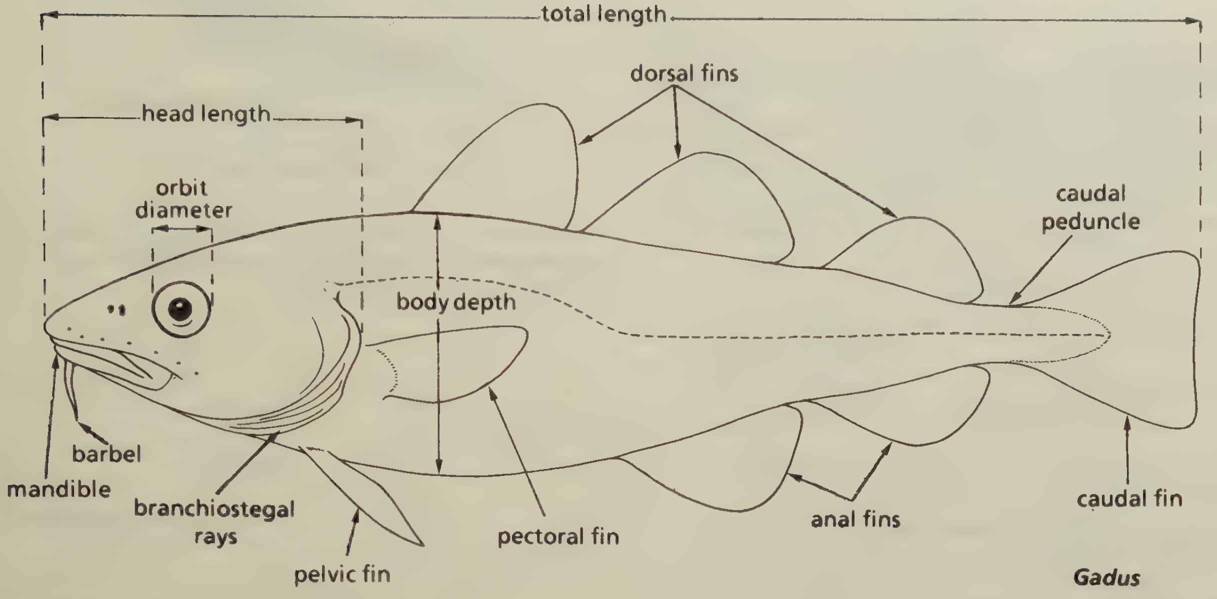
T. Inada

My special thanks to Walter Fischer, of FAO who encouraged and assisted in the production of this work and arranged for my visits to FAO headquarters in Rome, and to the BMNH and ISH. This work incorporated results of research on the Macrouridae spanning the last two decades. To list everyone who has helped in different ways during those years would be impossible, as it would entail including curators and assistants (past and present) of virtually every museum housing notable macrourid collections. To those persons to numerous to list, a heart feld thanks, and my apologies for not specifically listing by name. Several collections have been special significance to this work, and I take this opportunity to thank by name the persons connected with those collections: R.J. Lavenberg and assistants (LACM); V.G. Springer, R. Vari, and assistants (USNM); M. Stehmann, A. Post and assistants (ISH); J.E. Randall and A. Suzumoto (BPBM); A. Wheeler, N. Merrett and assistants (BMNH); K. Amaoka (HUMZ); I. Nakamura (FAKU); O. Okamura (DBKU); P.C. Heemstra (RUSI); B. Hully (SAM); L.W. Knapp (SOSC); J.R. Paxton (AMS); M. Gomon (NMV). Geoffrey N. Swinney (RMS) provided information on C.T. Regan types. P. McMillan (Fishery Agency, Wellington, New Zealand) provided identification characters for ***Coelorinchus bollonsi***, ***C. cookianus***, and ***C. fasciatus***, and information on other Australian and New Zealand grenadiers.

The bulk of the manuscript was completed before my visit in 1988 to the USSR, where tremendous collections of macrourids from the Indian Ocean were examined in Moscow and Leningrad. The results of my studies there could not be included to any great extent, but I was able to incorporate some refinements to the keys and descriptions of several species. I thank the respective academies of sciences of the USA and USSR for their support of my visit. N.V. Parin, Y.N. Shcherbachev, Y.I. Sazonov, E. Karamovskaya (PPSIO); I. Verghina (MMSU); A. Neyelov and V. Barsukov [deceased] (ZIL) are thanked for their hospitality and assistance.

T. Iwamoto

1.5 Illustrated Glossary of Technical Terms and Measurements


total length
head length
orbit diameter
dorsal fins
caudal peduncle
body depth
barbel
mandible
branchiostegal rays
pelvic fin
pectoral fin
anal fins
caudal fin
Gadus

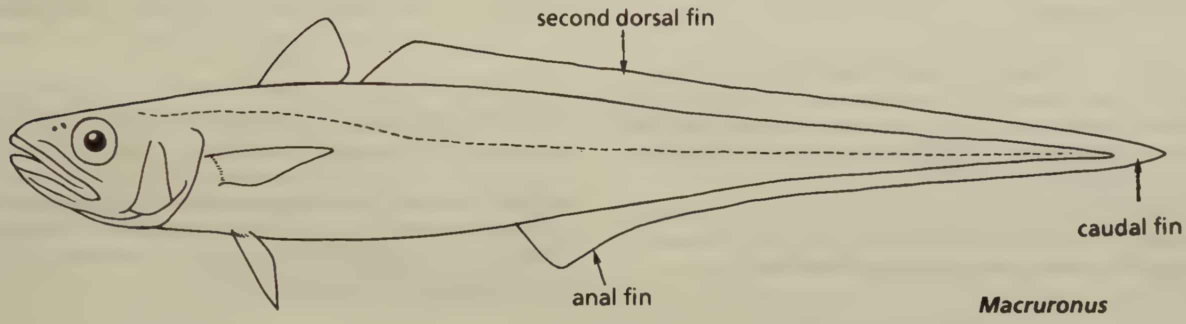

second dorsal fin
caudal fin
anal fin
Macruronus

Fig.3 External morphology and measurements

Barbel - A fleshy filament of variable size. In many gadiform species, one barbel is present on the chin (Fig. 3) and a variable number on the snout (Fig. 4).

Branchiostegal rays - Bony stays that support the membrane that seals the opening to the gill chamber (Fig. 3).

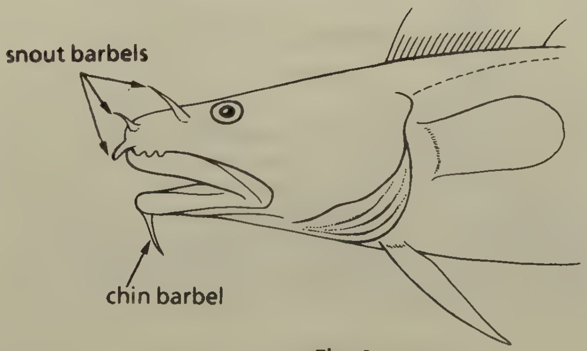

snout barbels
chin barbel

Fig. 4

Caudal fin - The shape of the hind margin of the caudal fin varies in different species, and sometimes even within species. The fin may be truncate, rounded, forked, concave, or asymmetrical (Fig. 5).

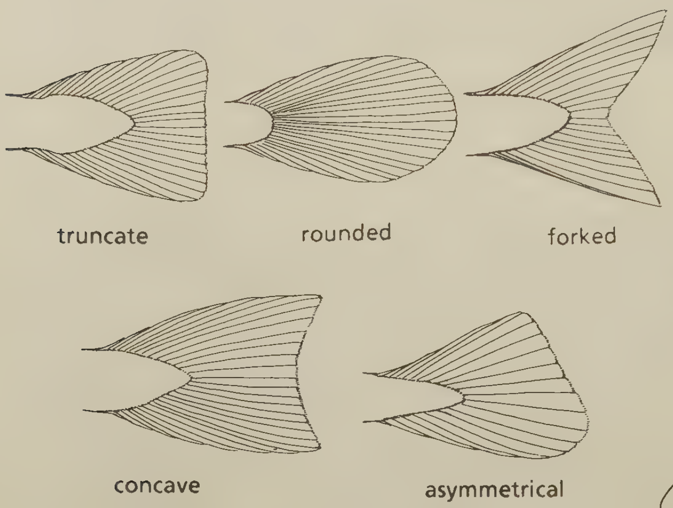

truncate
rounded
forked
concave
asymmetrical

Fig. 5 Shapes of caudal fin

Caudal peduncle - The region behind the ends of the dorsal and anal fin bases and before the procurrent rays of the caudal fin (Fig. 3). Not present in macrourids and several other genera.

Dentition - The teeth of gadiform fishes vary in shape from strong, recurved canines in ***Lyconus*** and ***Merluccius***, to compressed and closely set in ***Tripterophycis***, to very small, densely packed teeth in brush-like pads or rows in many other genera.

Frontals - Largest bones in the roof of the skull, bearing a V-shaped crest in merlucciids (Fig. 6).

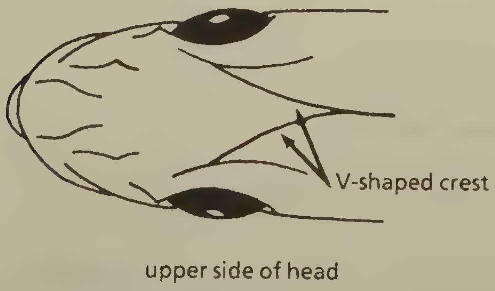

V-shaped crest
upper side of head

Fig. 6

Gill arch - The J-shaped structure under the gill cover (opercular flap) that carries fleshy gill filaments along the posterior outer margin and stiff bony gill rakers along the anterior outer margin (Fig. 7). Both filaments and rakers vary in size among some species. Rakers are absent along the outer margin of the first gill arch in some macrourids.

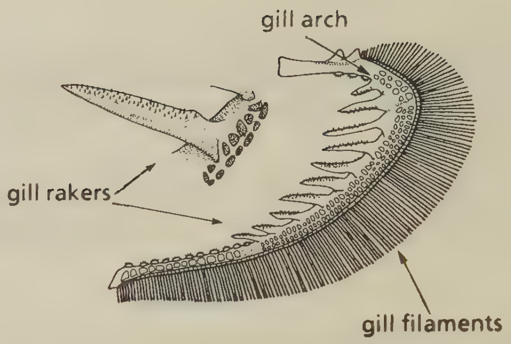

gill arch
gill rakers
gill filaments

Fig. 7 Gill arch of *Merluccius*

Gill opening - The opening of the flap over the gills is smaller and restricted to below the level of the pectoral fin in muraenolepidids (Fig. 8).

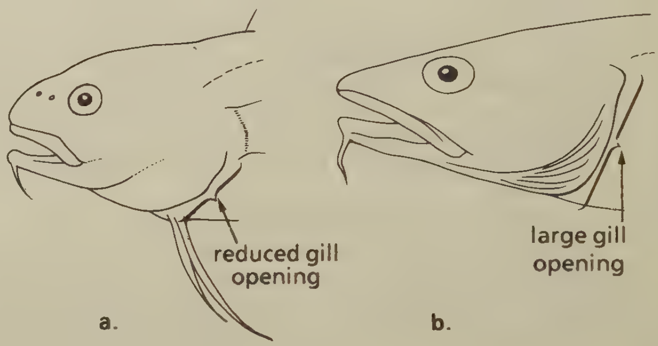

reduced gill opening
large gill opening
a.
b.

Fig. 8

Gill slits - The openings between gill arches. First gill slit restricted in some macrourids.

Hypural bones - The terminal bones at the posterior end of the vertebral column (Fig. 9). The number of bones, varying from one to several is important in classifying gadiform families.

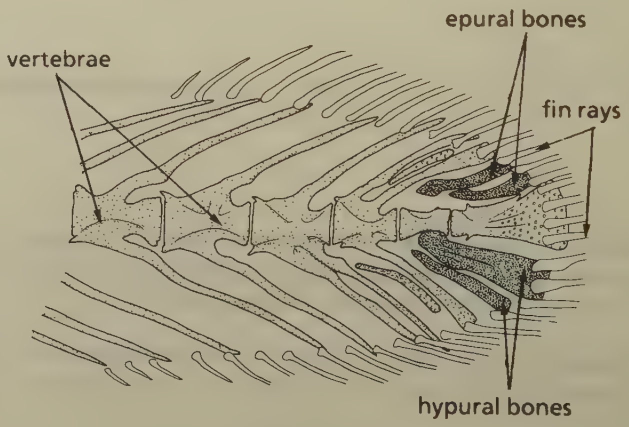

epural bones
vertebrae
fin rays
hypural bones

Fig. 9 Caudal skeleton (*Euclichthys*)
(from Patterson & Rosen, in Cohen, 1989)

Infraorbital (or suborbital) ridge - A longitudinal crest or ridge variously formed along the mid-lateral axis of the infraorbital region. Sharp and armed with strong, scute-like scales in many grenadiers (Fig. 10). Variously continuous with ridges on snout and preopercle, separating dorsal and ventral areas of head.

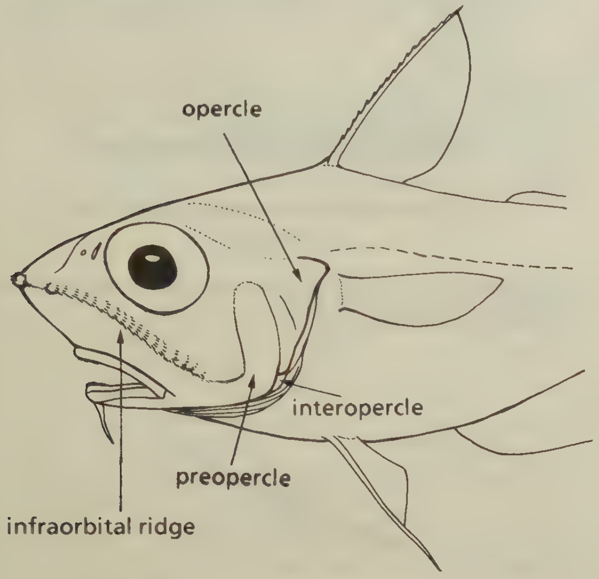

opercle
interopercle
preopercle
infraorbital ridge

Fig. 10 **Macrouridae**

Interopercle - One of the bones of the gill cover, useful in classifying macrourids (Figs. 10 and 14)

Lateral line - A sensory system that runs in a line along the body (Fig. 3) and is present also on the head. The position of the line on the body and the degree to which it is continuous or interrupted is a useful taxonomic character. On the head, it may be in a canal, which is marked by small pores, or it may be represented by series of tiny papillae which are sometimes sunk in pits and called pit organs (Fig. 11).

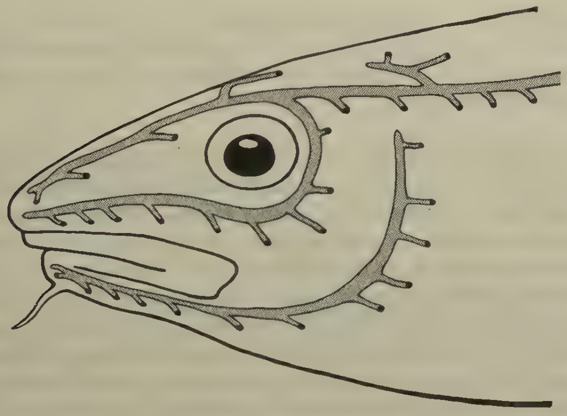


Fig. 11 **Lateral line system on head, with pores**
(adapted from Svetovidov, 1948)

Light organs - Of two kinds when present in gadiforms. One is an extensive area of silvery skin carrying a pattern of darkly pigmented striations (Fig. 12a) and occurs in the merlucciid ***Steindachneria***, the macrourids ***Hymenocephalus***, ***Lepidorhynchus***, and perhaps other genera as well. A second kind is indicated by a dark, scale-less area variously located on the ventral surface and occurs in a number of genera of morids and macrourids (Fig. 12b).

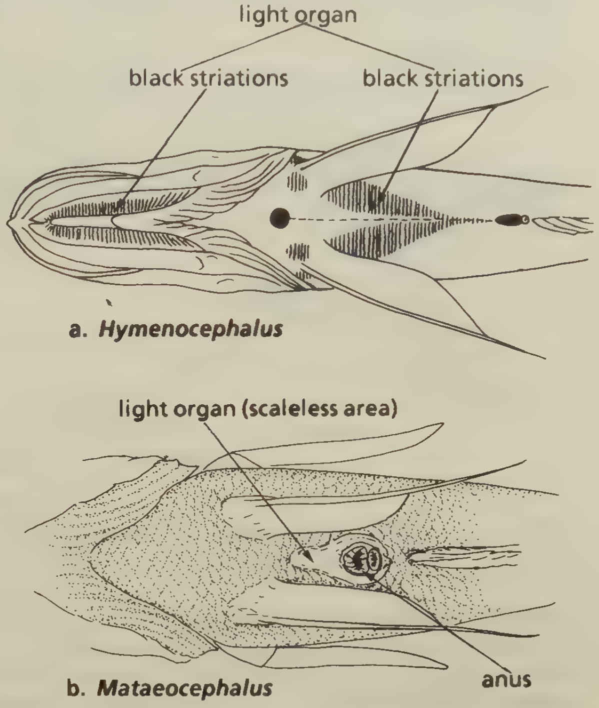
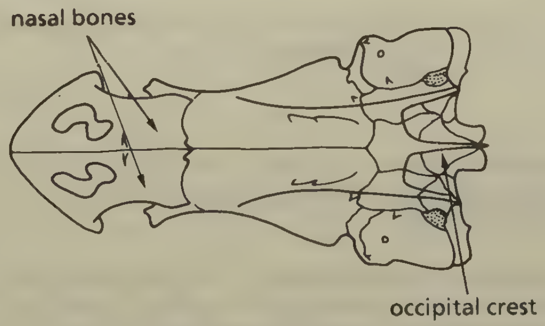

light organ
black striations
black striations
a. *Hymenocephalus*
light organ (scaleless area)
anus
b. *Mataeocephalus*

Fig. 12 **Ventral view**

Mandible - The lower jaw, which includes several bones, of which only the dentary bears teeth.

Nasals - Variously enlarged and anteriorly elongated in many macrourids. The median and lateral processes are united in some ***Coelorinchus*** forming a solid horizontal front to the snout (Fig. 13). A stout, spiny, button scale at top and lateral angles of snout in many macrourids.


nasal bones
occipital crest

Coelorhynchus kishinouyei

Fig. 13 **Dorsal view of skull**
(after Okamura, 1970b)

Nostrils - Paired openings from olfactory organ (Fig. 3). Sometimes with tentacles; variously located in some species and a useful taxonomic character.

Occipital crest - Compressed median crest at top rear of skull (Figs 13,14). Variously free from, or tightly connected with spine at top of first vertebrae.

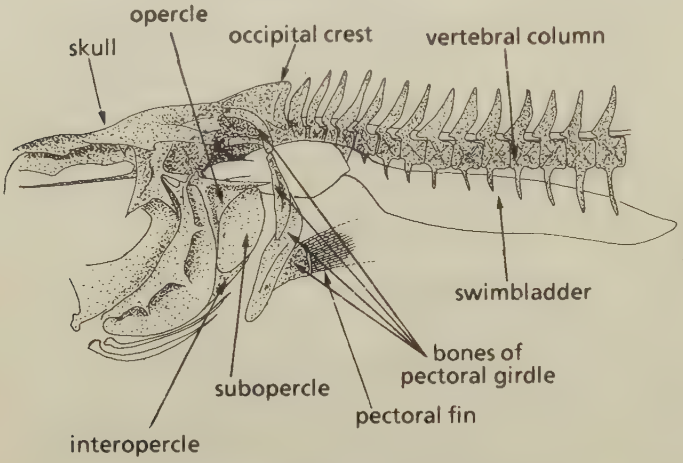


Fig. 14 **Anterior part of skeleton (Family Moridae)**
(after Paulin, in Cohen, 1989)

Olfactory bulbs - The part of the brain concerned with the sense of smell. In most fishes a swelling at the forebrain but in many gadiforms located farther anterior and connected to the main body of the brain by a slender olfactory tract.

Palatines - A pair of bones in the roof of the mouth located behind and lateral to the vomer. Sometimes bearing teeth.

Parapophyses - Paired bony projections from the ventral region of the vertebral centrum (Fig. 15).

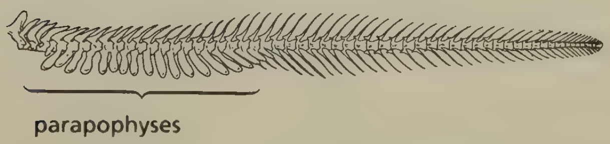


Fig. 15 Vertebral column, lateral view (*Eleginus*)
(from Svetovidov, 1948)

Pectoral girdle - A series of bones that support the pectoral fin and are attached dorsally to the rear of the skull (Fig. 14).

Premaxilla (= Premaxillary) - The elongate bone that forms the tooth-bearing part of the upper jaw in gadiform fishes. At the anterior end a dorsally directed prong called the premaxillary pedicel (Fig. 16).

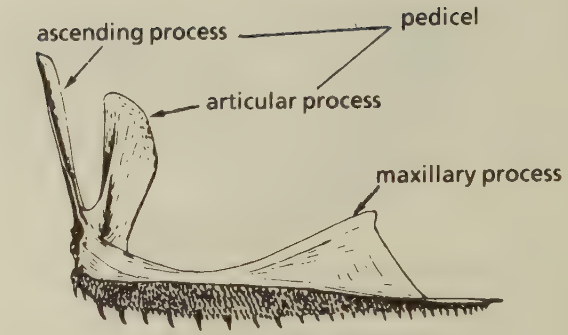


Fig. 16 Right premaxilla (medial view)
(Ventrifossa)

Procurrent rays - The shorter rays that extend along the caudal peduncle (Fig. 17).

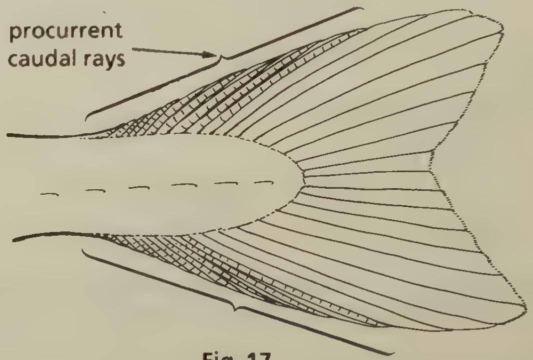


Fig. 17

Scale rows - Counted in two ways, along the lateral line and as number of oblique rows between lateral line and the base of the first or second dorsal fin.

Scale spinules - Tiny spines present to varying degree on the scales of many macrourids.

Subopercle - One of the bones of the gill cover (Fig. 14); the posteroventral angle is variously pointed in macrourids of the genus ***Coelorinchus*** and used as an identification aid.

Swimbladder - A gas filled sac in the dorsal part of the body cavity (Fig. 14). In gadiforms thick walled and important in classifying many forms. It may have anterior extensions that are attached to the rear of the skull as in morids, or ones that are free as in ***Gadus*** and perhaps other genera as well. In the swimbladder wall are found the rete mirabile, a system of capillary beds, and the gas gland, a structure that secretes and absorbs gas; both have characteristic patterns in many species. A paired sheet of muscles overlying the anteroventral end is present in males of some macrourids. These are believed to have sound-producing (drumming) capabilities.

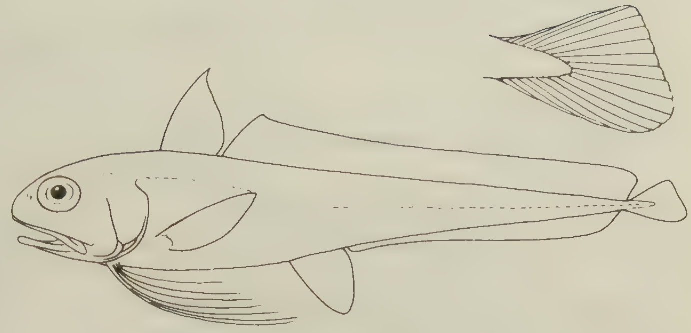
Vomer - A median bone at the forward part of the roof of the mouth, with teeth present or absent in gadiforms.

2. SYSTEMATIC CATALOGUE OF SPECIES

2.1 Key to Families

1a. Gill openings extending upward to at least the level of the pectoral fins. Scales rounded and overlapping in most, not at angles to each other

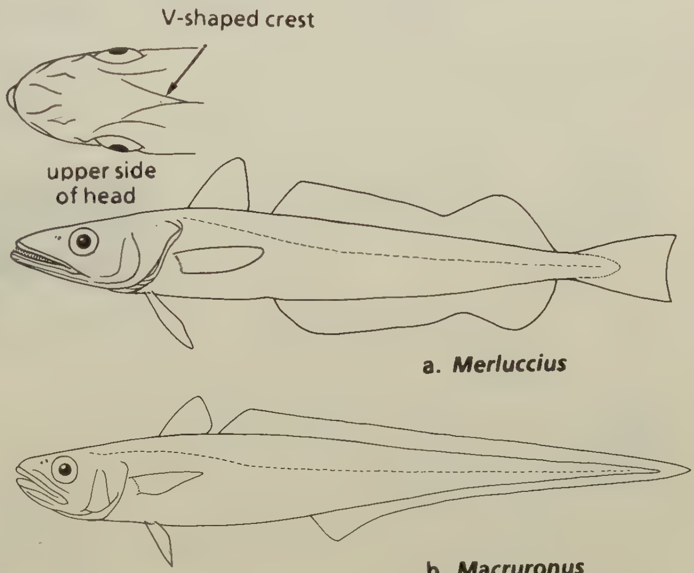
2a. Anterior dorsal fin orginating at rear of or behind head, not widely separate from following rays (in all but the New Zealand morid ***Auchenoceros***). Lateral line on side of body (except in a few grenadiers)


Euclichthyidae **Fig. 18**

3a. Tail fin externally asymmetrical (Fig. 18) .... **Family Euclichthyidae*** (Fig. 18)

3b. Tail fin externally symmetrical or absent

4a. Top of skull with a pair of more or- less well developed ridges in a V-shape with the point directed posteriorly (Fig. 19a)** .... **Family Merlucciidae** (Fig. 19)



a. *Merluccius*

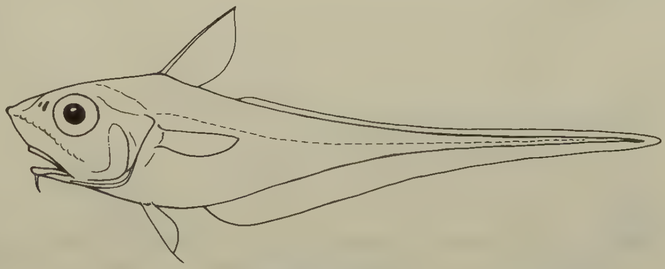
b. *Macruronus*

Merlucciidae **Fig. 19**

4b. Top of skull various, not as described above

5a. No tail fin (except a microscopic one in ***Trachyrinchus***) .. **Family Macrouridae** (Fig. 20)

5b. Tail fin present


Macrouridae **Fig. 20**

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* A single genus and species, ***Euclichthys polynemis,*** from the continental slopes of New Zealand and Australia. A small fish, relatively rare

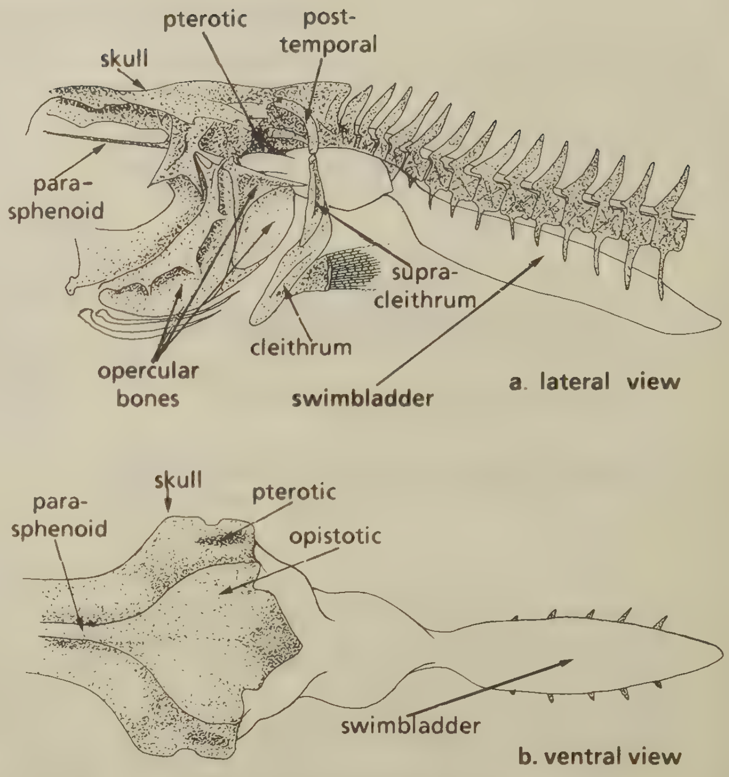
** This character works well for ***Merluccius*** and ***Macruronus***, less well for ***Lyconus*** and ***Steindachneria***

6a. Elongate anterior projections of the swimbladder attached to openings at rear of the skull (Fig. 21) .... **Family Moridae** (Fig. 22)

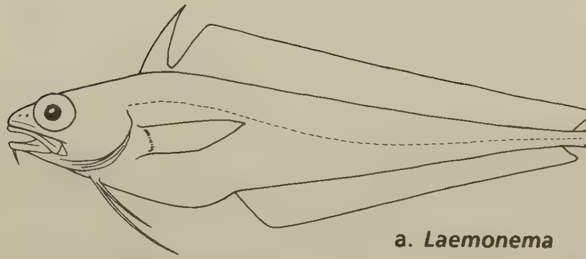
6b. Swimbladder either lacking anterior projections or, if present, not attached to rear of skull.

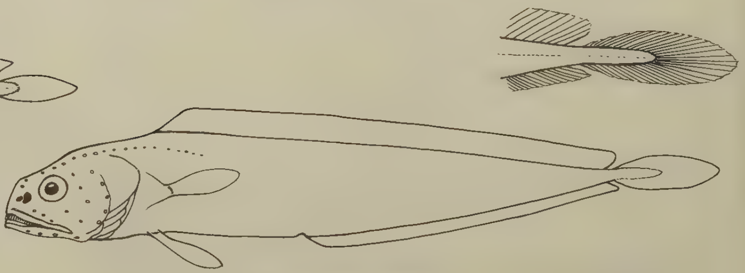
7a. Numerous procurrent caudal fin rays extending far forward on a very slender caudal peduncle, scarcely separated from the posterior rays of dorsal and anal fins (Fig. 23) ...... **Family Melanonidae***

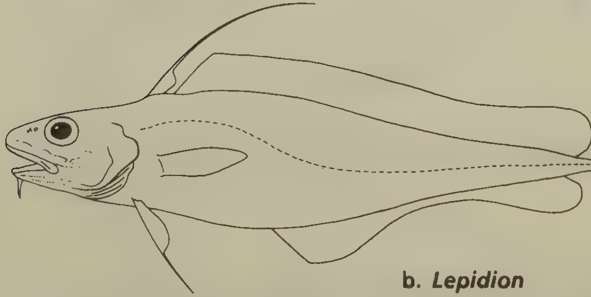
7b. Caudal fin and peduncle various, not as above .... **Family Gadidae** (Fig. 24)

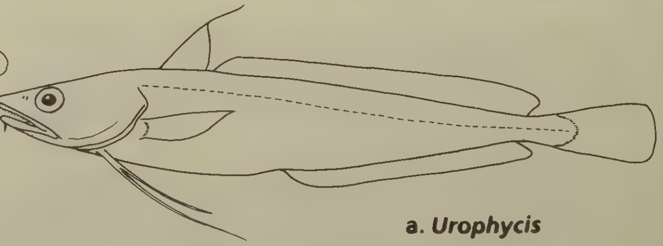

pterotic
post-temporal
skull
para-sphenoid
supra-cleithrum
cleithrum
opercular bones
swimbladder
a. lateral view
skull
para-sphenoid
pterotic
opistotic
swimbladder
b. ventral view

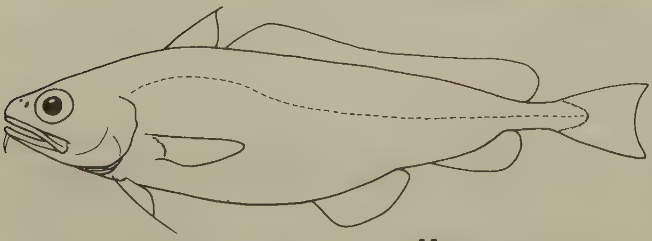
Swimbladder attachment to skull (Moridae) **Fig. 21**
(after Paulin, in Cohen, 1989)

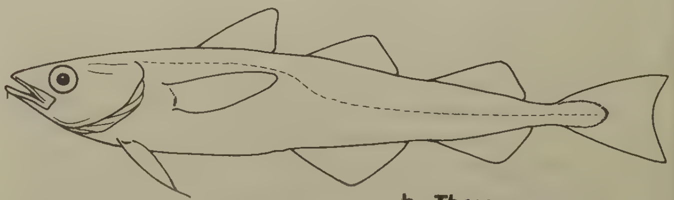

a. ***Laemonema***


Melanonidae **Fig. 23**


b. ***Lepidion***


a. ***Urophycis***


Moridae c. ***Mora***


Gadidae b. ***Theragra***

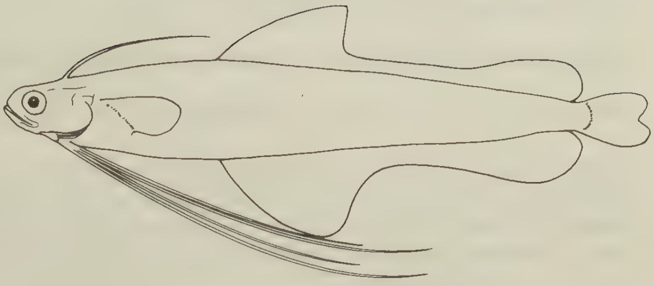
Examples of body shapes and fin patterns Fig. 22

Examples of body shapes and fin patterns Fig. 24

---

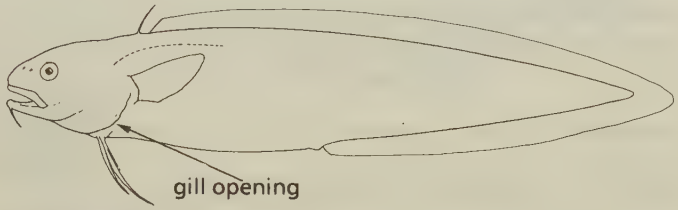
* One genus, ***Melanonus***, with two species of small, meso- to bathypelagic fishes. Not further treated

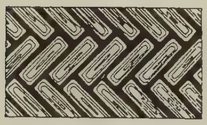
2b. First dorsal fin a single, elongate ray, widely separated from following rays, and inserted on top of head; when depressed fitting into a mid-dorsal groove between the dorsally directed lateral lines ...... **Family Bregmacerotidae** (Fig. 25)



Bregmacerotidae **Fig. 25**

1b. Gill openings restricted, not extending above the pectoral fins; scales elongate, non-overlapping, set at angles to each other (Fig. 26) .... ***Family Muraenolepididae****** (Fig. 26)





arrangement of scales
(schematic)

Muraenolepididae **Fig. 26**

---

* One genus, ***Muraenolepis,*** not well known taxonomically, with fewer than a dozen, relatively rare species (several undescribed),all cold-water fishes from far southern seas.

2.2 FAMILY BREGMACEROTIDAE

BREG

Family Name with Reference : Bregmacerotidae Gill, 1872, Smithsonian Misc.Colls., 247:3.

FAO Names : En - Codlets; Fr - Bregmacères; Sp - Bregmaceros.

General Features : First dorsal fin a single long ray on top of the rear part of head; second dorsal and anal fins long-based with well developed anterior and posterior lobes; pelvic fins under head, with long, thick rays, that extend beyond the beginning of anal fin; a well developed caudal fin present. Lateral line extending along dorsal margin of body. Additional details are presented by Marshall & Cohen, 1973, and Houde, 1984.

A single genus with an undetermined number of species (12 or more) comprises the family. Most species are small fishes living in the epipelagic of tropical oceanic areas. One species is found close to shore and is used by man for food. An incomplete review of the family was published by d'Ancona & Cavinato, 1965 and a comprehensive paper on early stages and taxonomy by Belianina, 1974.

Habitat, Distribution and Biology : Most species are small epipelagic or mesopelagic fishes living in tropical and subtropical oceanic waters, to depths of over 1 000 m, but some are found in shallow coastal areas and even in estuaries.

Interest to Fisheries : Only one species found close to the shore is fished at present.

Literature : D'Ancona & Cavinato (1965); Belianina (1974).

Remarks : Additional taxonomic work is required in order to define and classify the species and map their distributions (Houde, 1984). It is not at this time possible to write a key to the species.

Bregmaceros Thompson, 1840

BREG Breg

Genus with Reference : ***Bregmaceros*** Thompson, 1840, Mag.nat.Hist., (n.s.) 4:184.

Diagnostic Features : See family.

Tentative list of species :

Most of the species of ***Bregmaceros*** are difficult to characterize and identify; hence, additional research may show that some of the species listed below are synonyms and/or that species presently considered as synonyms are valid. Because of the difficulty in defining species, their geographical ranges cannot be defined.

Bregmaceros arabicus D'Ancona & Cavinato, 1965
Bregmaceros atlanticus Goode & Bean, 1886
Bregmaceros atripinnis (Tickell, 1865)
Bregmaceros bathymaster Jordan & Bollman, 1889
Bregmaceros cantori Milliken & Houde, 1984
Bregmaceros cayorum Nichols, 1952
Bregmaceros houdei Saksena & Richards, 1986
Bregmaceros japonicus Tanaka, 1908
Bregmaceros lanceolatus Shen, 1960
Bregmaceros longipes Garman, 1899
Bregmaceros mcclellandi Thompson, 1840
Bregmaceros nectabanus Whitley, 1941
Bregmaceros neonectabanus Masuda, Ozawa & Tabeta, 1986
Bregmaceros pescadorus Shen, 1960
Bregmaceros rarisquamosus Munro, 1950
Bregmaceros sp.

Bregmaceros sp. Fig. 27

BREG Breg 1

Synonyms : ***Bregmaceros mcclellandi,*** Cohen, 1983

FAO Names : En - Unicorn cod; **Fr** - Bregmacère de l'océan Indien; **Sp** - Bregmacero.

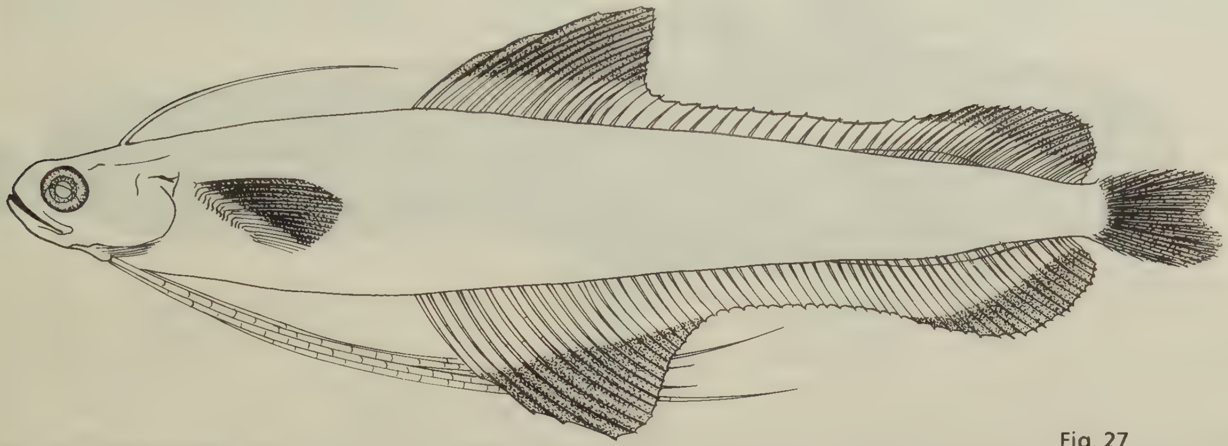


Fig. 27

Diagnostic Features : Upper part of pectoral fin black or rather dark; dark pigment usually present on caudal fin, anterior and posterior lobes of second dorsal fin, and anterior and posterior lobes of anal fin.

Geographical Distribution : Possibly widely distributed in the tropics, but this cannot be confirmed until the taxonomy is better known (Fig. 28).

Habitat and Biology : Neritic, taken also in estuaries; possibly oceanic as well.

Size : Maximum total length about 10 cm, common to 7 cm.

Interest to Fisheries : Caught in bagnets and trawls and marketed fresh in coastal areas of Maharashtra State, India. The 1987 catch was 2 319 metric tons (India and Mauritius); however, in 1973 it was as high as 6 500 metric tons.

Literature : Parulekar & Bal (1969); Cohen (1984a).

Remarks : The name ***Bregmaceros mcclellandi*** was used for this species by Cohen, 1984a and several previous authors but is probably incorrect (Houde, personal communication).

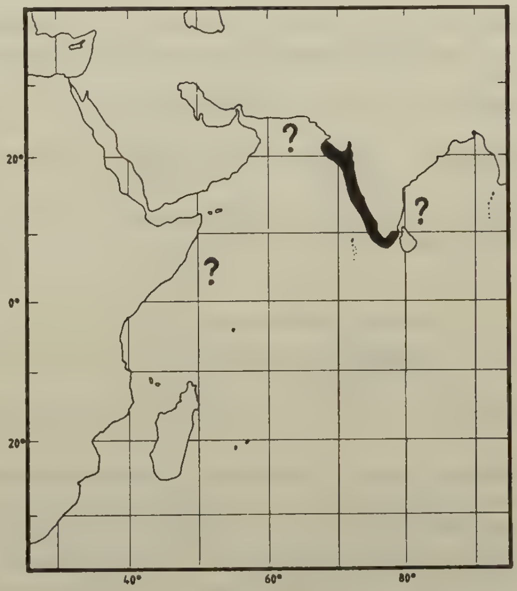


Fig. 28

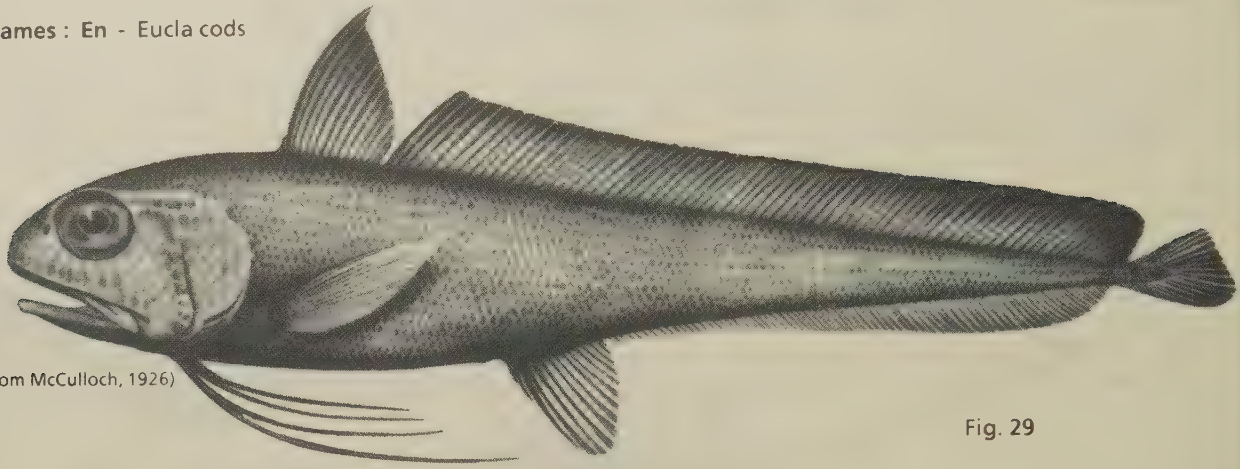
2.3 FAMILY EUCLICHTHYIDAE

Fig. 29

EUCL

Family Name with Reference : Euclichthyidae Cohen, 1984b

FAO Names : En - Eucla cods



(from McCulloch, 1926)

Fig. 29

General Features : Body long and tapering. Mouth large, no chin barbel. Two nearly contiguous dorsal fins, the first short based and high, the second long-based, extending to base of caudal fin; anal fin long with a big anterior lobe followed by a long, low portion slightly increasing in height posteriorly and ending at base of caudal fin; pelvic fins with 4 long, completely separate filamentous rays, the longest reaching beyond the anus; caudal fin small, externally asymmetrical. **Colour :** body pale, with a black tinge on bottom of head, fore part of body, and around anus; tip of first dorsal, rear of second dorsal, and caudal with dark margins.

Habitat, Distribution and Biology : Bentho-pelagic off New Zealand and around Australia, from Queensland to the northwest shelf, in depths between 250 and 800 m.

Interest to Fisheries : Taken as by catch in trawls, but apparently not abundant. Size to about 35 cm.

Literature : McCulloch (1926); Ayling & Cox (1982); Last et al. (1983); Cohen (1984b); Paxton et al., 1989.

Remarks : Recently established as a separate family by D. Cohen (1984b). It includes a single species ***Euclichthys polynemus.***

2.4 FAMILY GADIDAE

GADI

Family Name with Reference : Gadini Rafinesque, 1810, Indice d'Ittiologia Siciliana, p. 11.

General Features : Gill openings extend upward above the level of pectoral fins. Anterior dorsal fin originating at rear of or behind head; caudal fin externally symmetrical. No V-shaped ridge on top of skull. Scales in most species overlapping and rounded, not set at right angles to each other. Swimbladder not connected to rear of skull. A single hypural bone attached to last vertebra. Spine on top of first vertebra is tightly connected to a narrow crest at the rear of the skull. Additional details are presented by Marshall & Cohen (1973), Fahay & Markle (1984), Dunn & Matarese (1984), and several authors in Cohen (1989).

Habitat, Distribution and Biology : Small to very large fishes, ranging in size from 15 cm (***Gadiculus argenteus***) to at least 200 cm in total length (***Gadus morhua, Molva molva***). They are found in circumpolar to temperate waters, mainly of the northern hemisphere. Most species are demersal or benthopelagic, only a few (i.e. ***Arctogadus*** and ***Gadiculus*** species) are predominantly pelagic.Gadids are typically marine fish, but a number of species (i.e. ***Arctogadus borisovi, Boreogadus saida, Eleginus gracilis, Gadus morhua, Microgadus proximus*** and ***M. tomcod***) tolerate low salinities and hence also inhabit estuaries, and occasionally even freshwaters. One species, ***Lota lota***, is restricted to circumarctic freshwater lakes and rivers. Very few species are confined to littoral or inshore waters (i.e. ***Ciliata mustela***), some (i.e. ***Eleginus*** spp., ***Merlangius merlangus, Microgadus*** spp., ***Pollachius*** spp. and ***Raniceps raninus***) inhabit only shelf waters, but most extend to deeper waters on the slope beyond 500 m. Long-distance migrations are known for several gadid species (i.e. ***Boregadus saida, Gadus morhua, Gadus ogac*** and ***Melanogrammus aeglefinus***. Some species (i.e. ***Theragra chalcogramma)*** undertake diel vertical migrations, moving from the bottom to the surface at night. Schooling behaviour is well developed in certain species (i.e. ***Gadus macrocephalus*** and ***G. morhua***).

Interest to Fisheries : The family Gadidae is second only to the Clupeidae in terms of the global volume of fish landings from marine waters. The global catch of gadid species recorded for 1987 in the FAO Yearbook of Fisheries Statistics totalled 11 674 333 metric tons, and separate statistics are given for 25 species (see Table I).

Table I

1987 landings of Gadidae reported to FAO

English Name	Latin Name	Landings in thousands of metric tons (1987)	Fishing Areas*
Alaska pollack	*Theragra chalcogramma*	6 703 868	61,67
Atlantic cod	*Gadus morhua*	2 054 721	27, 21
Blue whiting	*Micromesistius poutassou*	707 955	27, 37
Saithe (= Pollack)	*Pollachius virens*	475 981	27, 21
Pacific cod	*Gadus macrocephalus*	441 107	61, 67
Haddock	*Melanogrammus aeglefinus*	398 522	27, 21
Norway pout	*Trisopterus esmarkii*	321 082	27
Whiting	*Merlangius merlangus*	152 608	27, 37
Southern blue whiting	*Micromesistius australis*	103 777	41, 81, 87
Ling	*Molva molva*	58 124	27
Tusk	*Brosme brosme*	46 254	27, 21
White hake	*Urophycis tenuis*	30 429	21
Saffron cod	*Eleginus gracilis*	27 929	61
Blue-ling	*Molva dypterygia*	27 365	27
Pouting (= Bib)	*Trisopterus luscus*	22 664	27, 37, 34
Pollock	*Pollachius pollachius*	17 898	27
Polar cod	*Boreogadus saida*	11 713	61, 27
Greenland cod	*Gadus ogac*	4 017	21
Wachna cod (= Navaga)	*Eleginus navaga*	3 765	27
Red hake	*Urophycis chuss*	2 626	21
Greater forkbeard	*Phycis blennoides*	1 612	27, 37, 34
Burbot	*Lota lota*	1 577	freshwater
Brazilian codling	*Urophycis brasiliensis*	1 266	41
Poor cod	*Trisopterus minutus*	935	37
Atlantic tomcod	*Microgadus tomcod*	10	21
		TOTAL 10 917 468	

As shown in the above table, most of these landings provene from the traditional cold-water trawl fisheries of the northern hemisphere.

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* See map of fishing areas on page 398

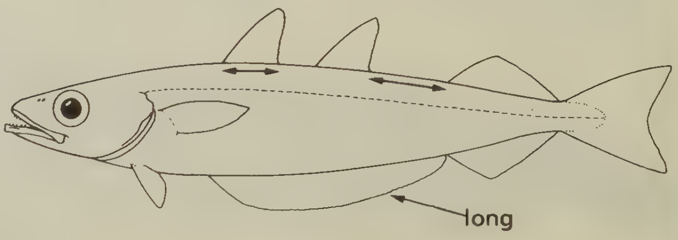
Remarks : The family has been revised by Svetovidov (1948) but our knowledge of this important group is still far from completed. It also included genera now placed in Moridae and Merlucciidae until the work of Svetovidov (1937), which has been followed by most ichthyologists. Several different classifications have been discussed in Cohen (1989). For the purposes of the present publication, only the following genera are here included in Gadidae: ***Arctogadus*, *Boreogadus*, *Brosme*, *Ciliata*, *Eleginus*, *Enchelyopus*, *Gadiculus*, *Gadus*, *Gaidropsarus*, *Lota*, *Melanogrammus*, *Merlangius*, *Microgadus*, *Micromesistius*, *Molva*, *Phycis*, *Pollachius*, *Raniceps*, *Theragra*, *Trisopterus*, and *Urophycis*.**

Key to Genera:

1a. Anal fins 2. Dorsal fins 3, the last one originating far posterior to the level of the vent

  2a. First anal fin base very long, one-half or more of preanal distance

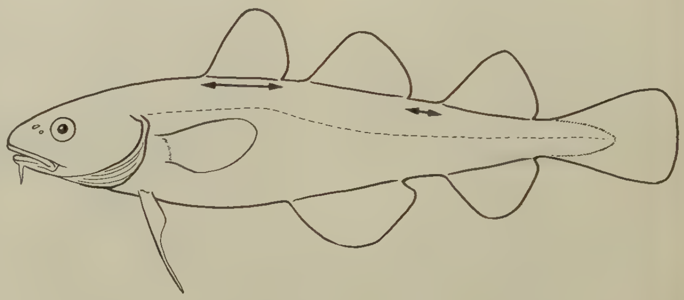
    3a. Dorsal fins widely separated, space between second dorsal and third dorsal greater than length of base of first dorsal .... ***Micromesistius*** (Fig. 30)



Micromesistius Fig. 30

    3b. Dorsal fins closer together, space between second dorsal and third dorsal less than length of base of first dorsal

      4a. Lateral-line pores on head absent; although small papillae or pits may be present. ***Microgadus**** (Fig. 31)



Microgadus Fig. 31

      4b. Lateral-line pores present on head (Fig. 32)

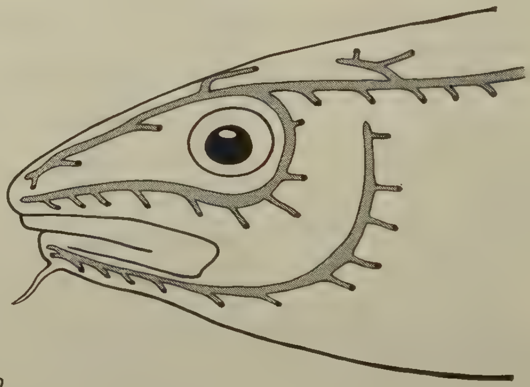
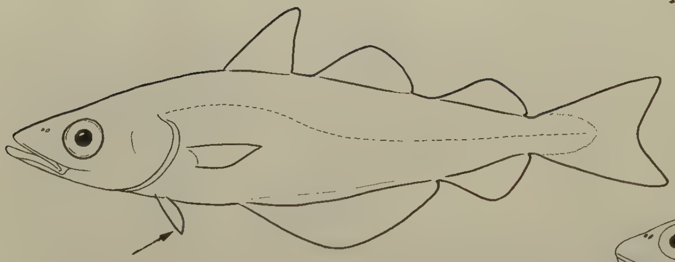


Fig. 32

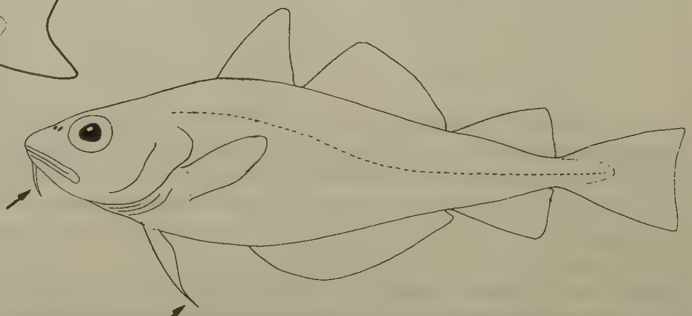
        5a. Pelvic fin with no elongated ray (Fig. 33) .... ***Pollachius***

        5b. Pelvic fin with a slightly elongated ray

          6a. Chin barbel well developed .. ***Trisopterus*** (Fig. 34)



Pollachius Fig. 33



Trisopterus Fig. 34

* Entered twice in key, under 4a and 11b

6b. Chin barbel absent or small .... ***Merlangius*** (Fig. 35)

2b. First anal fin base short, less than one-half of pre-anal length

7a. Eye large, greater than snout length. Mouth strongly oblique .... ***Gadiculus*** (Fig. 36)

7b. Eye smaller, less than snout length. Mouth generally horizontal to moderately oblique

8a. No lateral line pores on head; although small papillae or pits may be present

9a. Lateral-line interrupted along its entire length on side of body (Figs 37,38)

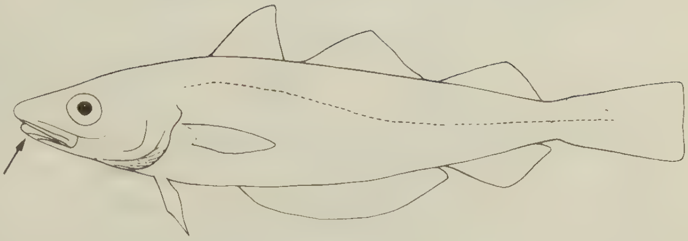
10a. Scales overlapping. Palatine teeth (on roof of mouth) sometimes present .... ***Arctogadus*** (Fig. 37)

10b. Scales very small, embedded and non overlapping. Palatine teeth never present .... ***Boreogadus*** (Fig. 38)

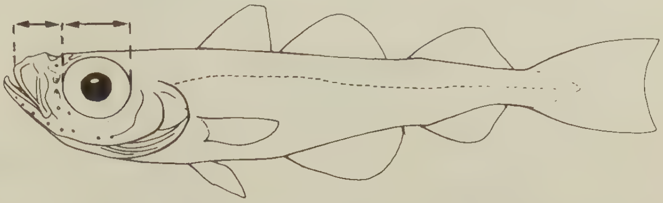
9b. Lateral line continuous along all or part of its length (Fig. 39)

11a. Lateral line continuous to origin of second dorsal fin. Parapophyses expanded at their tips (Fig. 40a) .... ***Eleginus*** (Fig. 39)

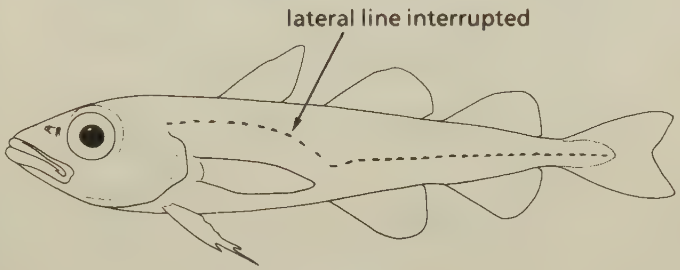
11b. Lateral line continuous to end of third dorsal fin. Parapophyses not expanded at their tips (Fig. 40b) ... ***Microgadus*** (Fig. 31)



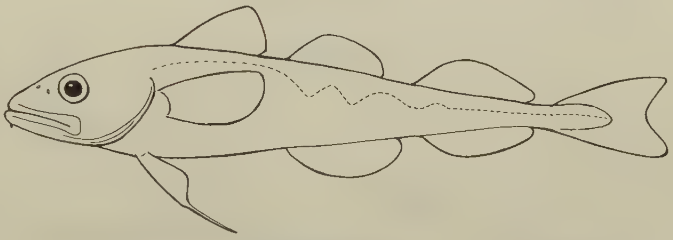
Merlangius Fig.35



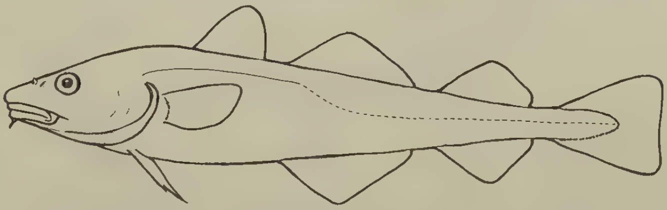
Gadiculus Fig. 36



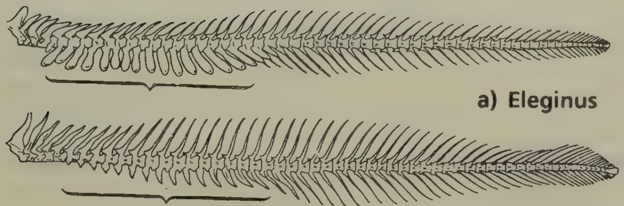
Arctogadus Fig. 37



Boreogadus Fig. 38



Eleginus Fig. 39



a) Eleginus

b) Microgadus

vertebral column Fig.40

8b. Lateral line pores present on head

12a. Lower jaw longer than upper .... ***Theragra*** (Fig. 41)

12b. Upper jaw longer than lower

13a. A large dark blotch above pectoral fin. Lateral line dark, continuous to end of body .... ***Melanogrammus*** (Fig. 42)

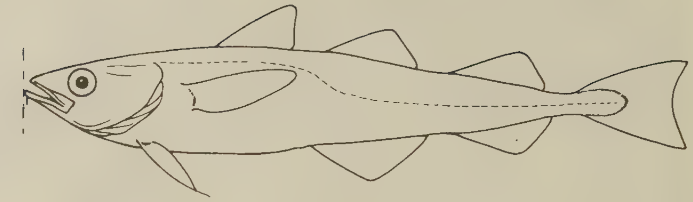
13b. No dark blotch above pectoral fin. Lateral line pale, interrupted posteriorly (Fig. 43) .... ***Gadus***

1b. Anal fin one. Dorsal fins one or more, the last one (sometimes the only one) originating ahead of the level of the vent

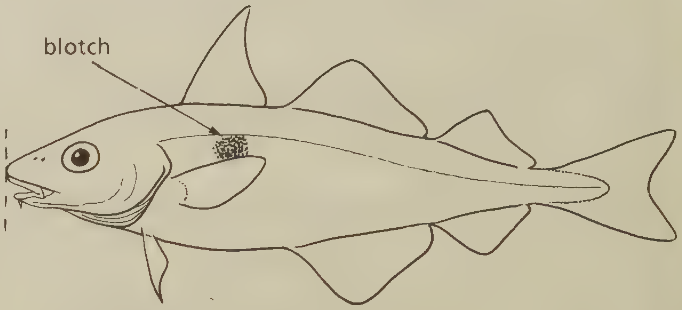
14a. First dorsal ray followed by a row of small, fleshy filaments (Fig. 44)

15a. Barbels on snout 2 (Fig. 46a) .... ***Gaidropsarus*** (Fig. 45)

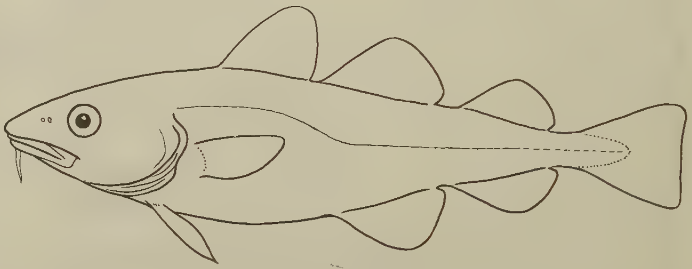
15b. Barbels on snout three or more



Theragra Fig. 41



Melanogrammus Fig. 42



Gadus Fig. 43

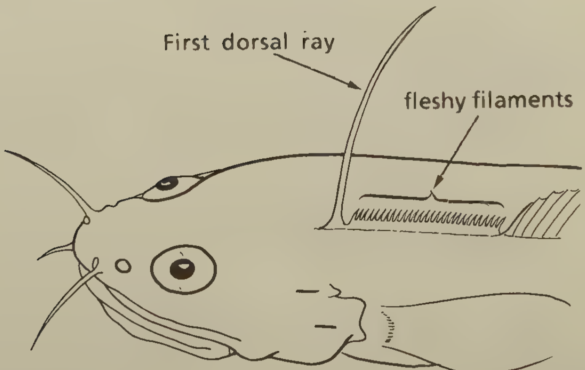
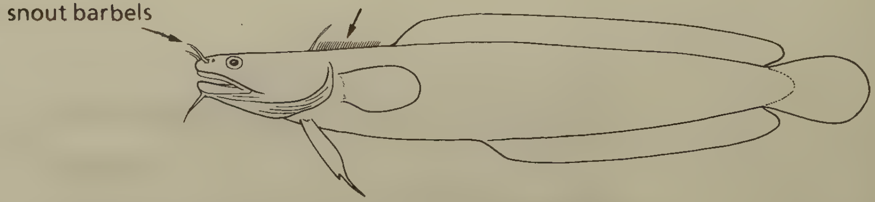


Fig. 44



Gaidropsarus Fig. 45

16a. Barbels on snout 3 (Fig 46b) ...... ***Enchelyopus*** (Fig. 47)

16b. Barbels on snout 4 or more (Fig. 46c) .. ***Ciliata*** (Fig. 48)

14b. First dorsal ray not followed by a row of small, fleshy filaments

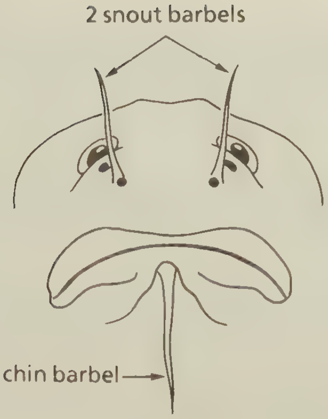
17a. Dorsal fin one .... ***Brosme*** (Fig. 49)

17b. Dorsal fins two

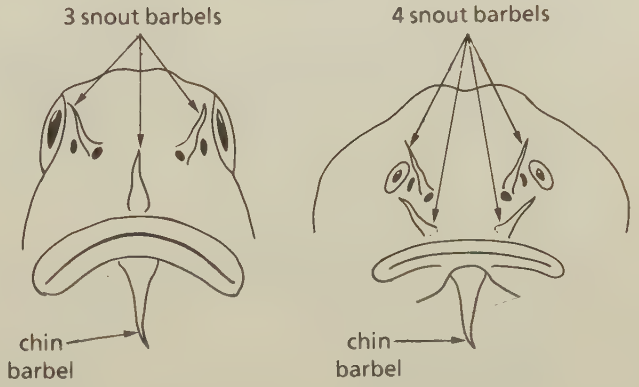
18a. First dorsal fin poorly developed, with three short rays (sometimes only one easily visible). Head notably depressed .... ***Raniceps*** (Fig. 50)

18b. First dorsal fin well developed, with eight or more rays

19a. Pelvic fin with two greatly elongated rays, extending beyond the tip of the pectoral fin and in many species beyond the beginning of the anal fin

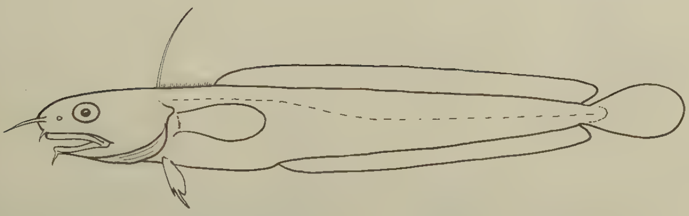

2 snout barbels
chin barbel

a) *Gaidropsarus*

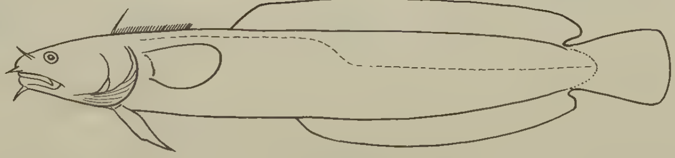

3 snout barbels
4 snout barbels
chin barbel
chin barbel

b) *Enchelyopus* **c) *Ciliata***

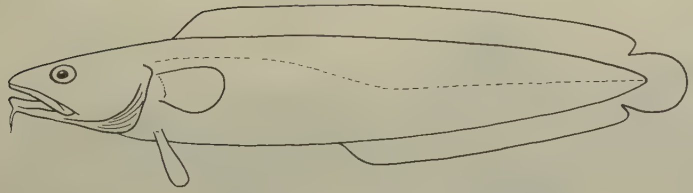
Front views of head Fig: 46



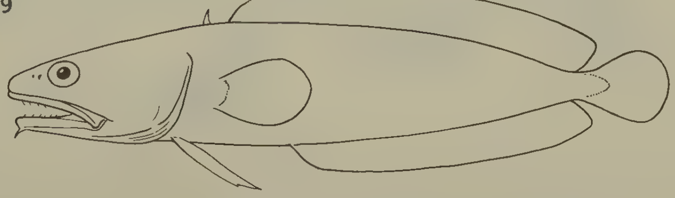
Enchelyopus Fig. 47



Ciliata Fig. 48



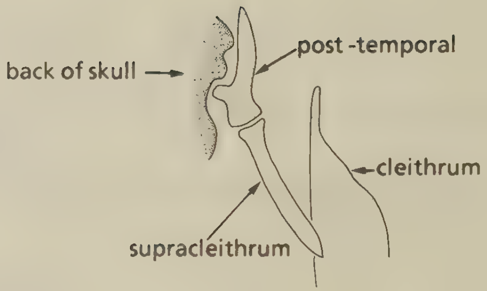
Brosme Fig. 49



Raniceps Fig. 50

20a. Two well-developed bones (post temporal and supracleithrum) at top, front edge of shoulder girdle, loosely attached to back of skull and cleithrum (Fig. 51) .... ***Phycis*** (Fig. 52)

20b. Bones between back of skull and cleithrum very small or lacking .... ***Urophycis*** (Fig. 53)

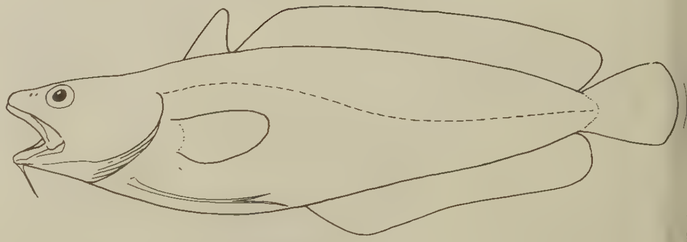


Phycis (pectoral girlde) Fig. 51

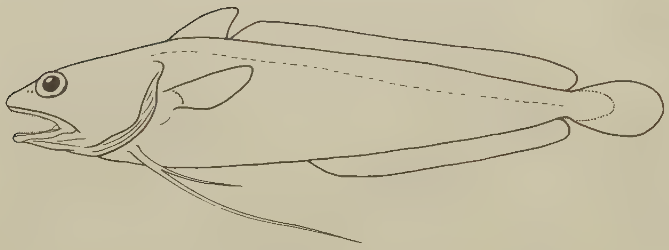
19b. Pelvic fin without two greatly elongate rays; tip of fin falling short of end of pectoral fin

21a. Anterior nostril with a prominent fleshy flap. No lateral line pores on head. Teeth all small and brushlike .... ***Lota*** (Fig. 54)

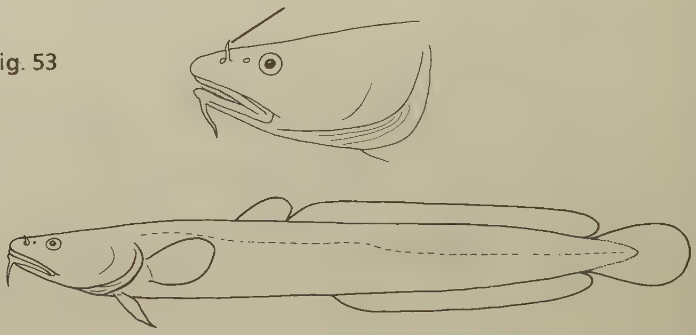
21b. Anterior nostril lacking fleshy tentacle. Lateral line pores present on head. Some teeth large and prominent .... ***Molva*** Fig. 55)



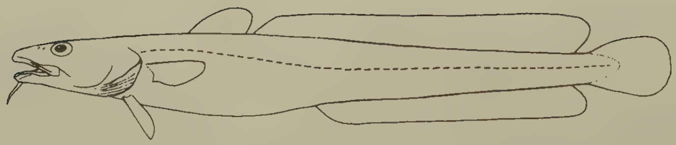
Phycis Fig. 52



Urophycis Fig. 53



Lota Fig. 54



Molva Fig. 55

Arctogadus

Genus with Reference : ***Arctogadus*** Drjagin, 1932, Zool.Anz., 98:151.

Diagnostic Features : Jaws of about equal length or lower jaw protruding. Palatine teeth almost always present. Three dorsal fins, two anal fins; all separate from each other; first anal fin base short, less than one-half of preanal distance. Scales overlapping. Lateral line interrupted along its entire length. No lateral-line pores on head.

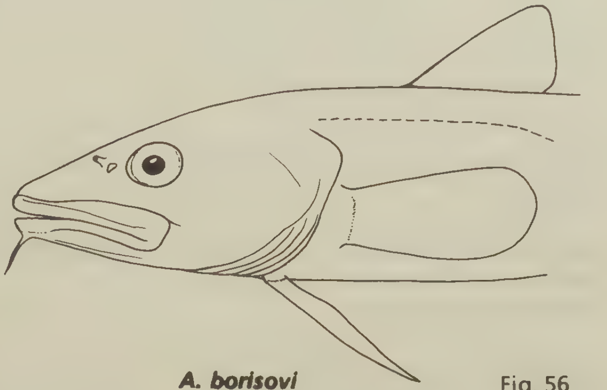
Habitat, Distribution and Biology : Pelagic, often associated with ice far at sea, ***A. glacialis*** , or in brackish water close to land (***A. borisovi***).

Interest to Fisheries : See species.

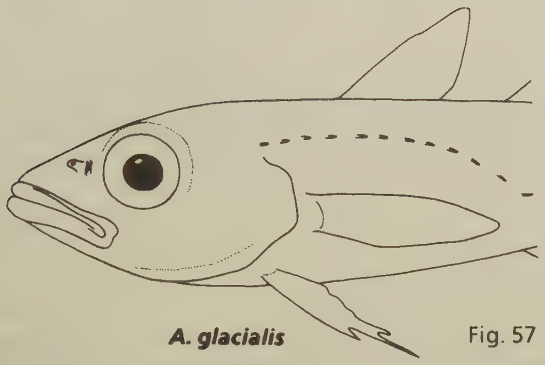
Key to species:

1a. Chin barbel well-developed (Fig. 56) .... ***A. borisovi***

1b. Chin barbel rudimentary or absent (Fig. 57) .... ***A. glacialis***



A. borisovi Fig. 56



A. glacialis Fig. 57

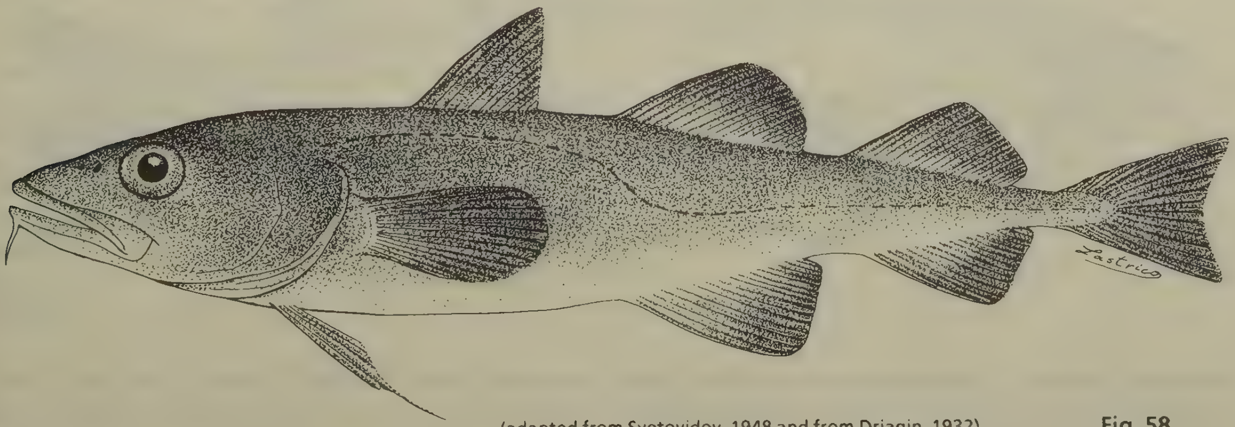
Arctogadus borisovi Drjagin, 1932

Fig. 58

Scientific Name with Reference : ***Arctogadus borisovi*** Drjagin, 1932, Zool.Anz., 98:151.

Synonyms : ***Boreogadus pearyi*** Nichols & Maxwell, 1933.

FAO Names : **En** - East Siberian cod.



(adapted from Svetovidov, 1948 and from Drjagin, 1932) **Fig. 58**

Diagnostic Features : Chin barbel well-developed. Gill rakers on first arch 33 (31 to 35). Interorbital width 6.1% (5.1 to 7.0) of standard length; horizontal diameter of orbit 7.1% (6.2 to 8.5) of standard length. Not all specimens can be readily identified with these characters.

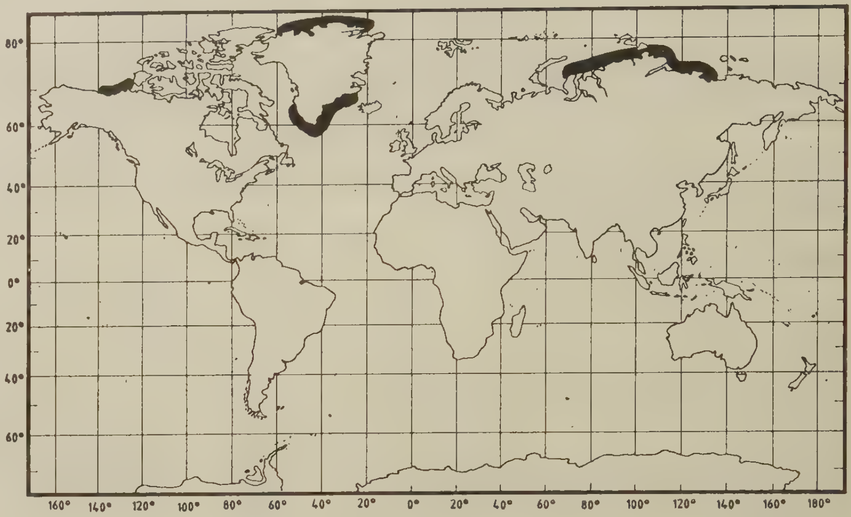


Fig. 59

Geographical Distribution : Western half of Canadian Arctic coast, Arctic coasts of Siberia, also off northern and southern coasts of Greenland (Fig. 59).

Habitat and Biology : Mostly found near the bottom in littoral waters, but also far from shore, associated with pack ice. Entering low-salinity river mouths according to Andriashev (1954), avoiding low salinities according to Moskalenko (1960).

Size : Reaches at least 50 cm total length.

Interest to Fisheries : Probably taken as bycatch in trawls, but of very little economic value.

Literature : Andriashev (1954); Moskalenko (1960); Nielsen & Jensen (1967); Andriashev et al. (1980).

Arctogadus glacialis (Peters, 1874)

Fig. 60

GADI Arc 2

Scientific Name with Reference : ***Gadus glacialis*** Peters, 1874, Die seite deutsche Nordpolarfahrt., Zweiter Bd.:2.

Synonyms : ***Phocaegadus megalops*** Jensen, 1948.

FAO Names : En - Artic cod ; **Fr** - Morue arctique; **Sp** - Bacalao del Artico.

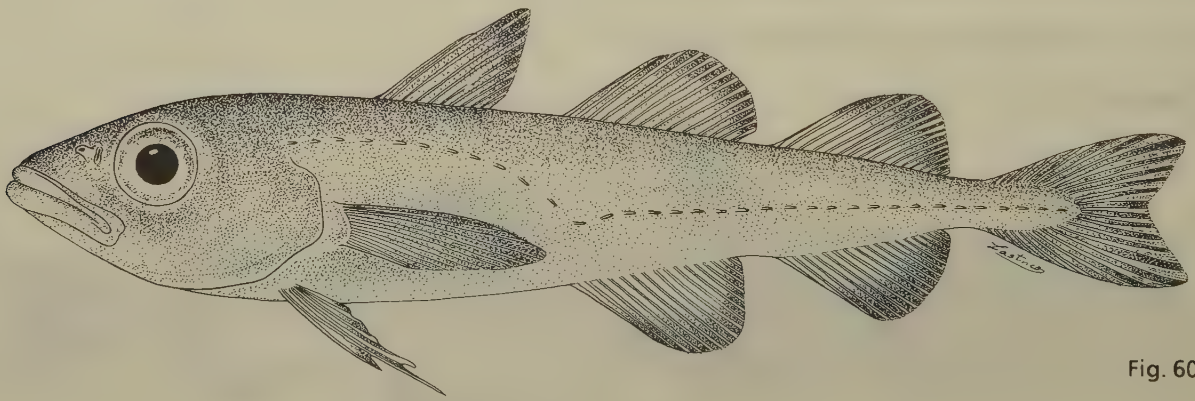


Fig. 60

Diagnostic Features : Chin barbel rudimentary of absent. Gill rakers on first arch 30 (27 to 34). Interorbital width 5.6% (4.4 to 6.8) of standard length; horizontal diameter of orbit 9.0% (8.0 to 11.0) of standard length. Not all specimens can be readily identified with these characters.

Geographical Distribution : Apparently widely distributed in western part of arctic basin, also northwest and northeast coasts of Greenland (Fig. 61).

Habitat and Biology : A pelagic species, associated with ice, found mainly in offshore waters, at or beyond the edge of the continental shelf, from the surface to about 1 000 m depth. No information is available on its biology.

Size : Reaches at least 32.5 cm total length.

Interest to Fisheries : Caught by Norway with trawls between 230 and 930 m depth. The major fishing grounds are located in the northeastern part of the East Siberian Sea, off East Greenland (Sabine Island), and north of the Baffin Sea (74 to 77°N). It is used as fish meal and oil, and has little importance as food.

Literature : Nielsen & Jensen (1967); Andriashev et al. (1980).

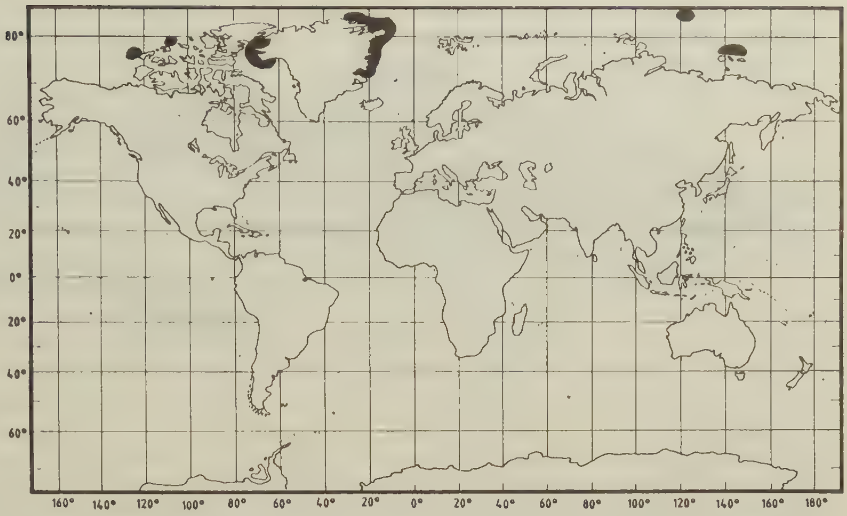


Fig. 61

Boreogadus

GADI Bor

Genus with Reference : ***Boreogadus*** Günther, 1862, Cat.Fish., 4:336.

Diagnostic Features : See species.

Remarks : A single species presently recognized (see Andriashev, 1954).

Boreogadus saida (Lepechin, 1774)

Fig. 62

GADI Bor 1

Scientific Name with Reference : ***Gadus saida*** Lepechin, 1774, Novi Comment.Acad.Sci.Petropol., 18:512

Synonyms : ***Merlangus polaris*** Sabine, 1824; ***Gadus fabricii*** Richardson, 1836; ***Gadus agilis*** Reinhardt, 1838; ***Pollachius polaris,*** Gill, 1862; ***Boreogadus polaris,*** Gill, 1863.

FAO Names : **En** - Polar cod; **Fr** - Morue polaire; **Sp** - Bacalao polar.

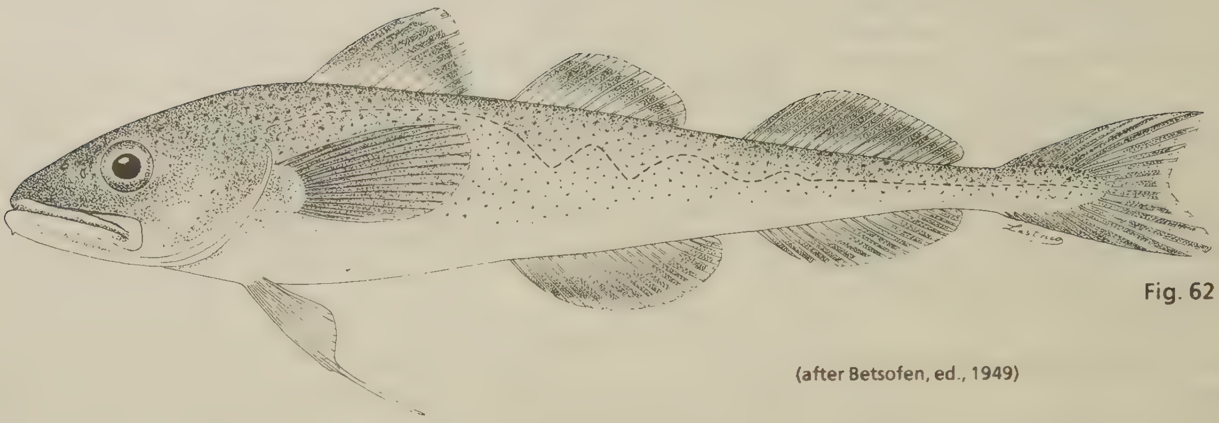


Fig. 62

(after Betsofen, ed., 1949)

Diagnostic Features : Jaws of about equal length or lower jaw slightly longer. Chin barbel very small. Palatine teeth always absent. Three dorsal fins, two anal fins, all separate from each other; first anal fin base short, less than one-half of preanal distance; caudal fin deeply concave. Pectoral fin reaching beyond end of first dorsal fin; pelvic fin with a slightly elongated ray. Lateral line interrupted along its entire length, variable in position. No lateral line pores on head. Scales small and embedded, not overlapping. **Colour:** along back brownish, with many fine dark points; sides and belly silvery; fins dusky, with pale margins.

Geographical Distribution : Found throughout the entire north polar basin, around Greenland and Iceland, into Hudson Bay and in the north and northwest Bering Sea (Fig. 63).

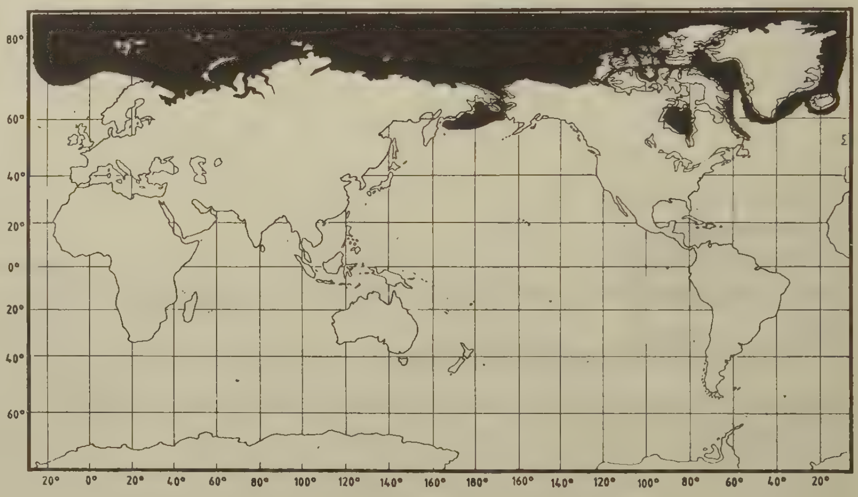


Fig. 63

Habitat and Biology : The Arctic cod is circumpolar and occurs in coastal habitats during both summer and winter. In the Beaufort Sea, it is also found in brackish lagoons and in almost fresh water in river mouths. Although associated with the occurrence of ice (White Sea), the Arctic cod is present in ice-free nearshore waters (Alaska); also found at 50-175 km offshore in the Beaufort and Chukchi Seas, at depths of 40 to 400 m. This fish is tolerant of widely fluctuating temperatures, salinities, and turbidities.

Migration patterns are unknown, except for a prespawning migration to nearshore waters in late summer in the Beaufort Sea. The Barents Sea stock also undertakes winter mass migrations into the White Sea for spawning.

In the Beaufort Sea, most mature males are 2 to 3 years old, whereas most mature females are 3 years old. These ages at first maturity are similar to those reported for the northwest Atlantic and Soviet stocks. In Cheshskaya Bay (White Sea), sexual maturity occurs in the 4th to 5th year of life. A predominance of females among older fish is reported in most populations of Arctic cod (74% females in populations of 3 to 6 years old fish).

Arctic cod spawns once in its lifetime . Its fecundity is 9 000 to 21 000 eggs, on average 11 900 eggs per females. The spawning season extends from late November to early February in the Beaufort Sea, from end of December to February in Soviet waters, and from January to February (sometimes April) in the White Sea. Although spawning occurs in the coastal areas of the Beaufort Sea and under the shore ice of the White and Barents Seas, the relative importance of nearshore sites compared with regions farther offshore for spawning remains unknown.

Because of the unpredictable conditions of its environment, Arctic cod is an r-selected species with early maturity, rapid growth, production of larger numbers of offspring at a given parental size, small body size, high rates of mortality, and shorter life span. Lagoon and coastal fish are larger at each age than those from deep offshore waters, since warmer coastal waters provide more favourable growth conditions. In Simpson lagoon (Beaufort Sea), a 1 year individual may attain 60 mm total length (usually 21 mm), and older fish vary from 45-257 mm (usually 60-170 mm) while the largest fish offshore usually vary from 60-110 mm; the maximum age is 6-7 years.

Arctic cod feed mostly on epibenthic mysids and also on amphipods and copepods. For those that are under the ice surface in offshore waters, fish is the principal food item during the winter. Although they prefer to eat mysids, the dietary importance and proportions of the major groups of prey are based on prey availability. For example, the food of some of the specimens examined in the White Sea consisted exclusively of young shrimp.

It is an important food-fish for many of the larger mammals and birds of the Arctic seas.

Size : Reaches 40 cm total length; common to 25 cm.

Interest to Fisheries : Arctic cod used to be intensively fished by USSR, Norway, Danish and German Dm Rp vessels using bottom- and mid-water trawls. The fishing grounds are the European part of USSR, Barents and White Seas, and the northwest Atlantic. The fish is pursued from January through May producing massive catches during February. In 1984, world catches totalled 23 709 metric tons, and after that year they declined steadily, although the stocks are little affected by fishing because r-selected species can support higher levels of fishing mortality and have a quicker recovery time. The total catch reported for 1987 in the FAO Yearbook for Fishery Statistics is 11 713 metric tons , all taken by USSR.

In Canadian waters, Arctic cod has a limited commercial value because it is small and apparently not abundant. The flesh is said to be of low quality. It is exploited in a minor way as an industrial fish, but has great potential for increased catches. Its major utilization by Norwegians is for fish meal and oil.

Local Names : CANADA: Arctic cod, Polar cod; DENMARK : Polartorsk; GERMANY : Polardorsch; NORWAY : Polartorsk; USA: Arctic cod, Polar cod; USSR : Saika.

Literature : Jensen (1948); Andriashev (1954); Moskalenko (1964); Leim & Scott (1966); Wheeler (1978); Altukhov (1979); Craig et al. (1982).

Brosme

GADI Bro

Genus with Reference : ***Brosme*** Cuvier in Oken, 1817, Isis:1182.

Diagnostic Features : See species.

Remarks : A single species in the genus.

Brosme brosme (Ascanius, 1772)

Fig. 64

GADI Bro 1

Scientific Name with Reference : ***Gadus brosme*** Ascanius, 1772, Icones Rerum, 2:7.

Synonyms : ***Gadus torsk*** Bonnaterre, 1788; ***Gadus lubb*** Euphrasen, 1794; ***Blennius torsk,*** Lacepède; ***Enchelyopus brosme*** Bloch & Schneider, 1801; ***Brosmius flavesny*** LeSueur, 1819; ***Brosmius vulgaris*** Fleming, 1828; ***Brosmius scotica*** Swainson, 1839; ***Brosmius flavescens*** Günther, 1862; ***Brosmius americanus*** Gill, 1863; ***Brosmius brosme,*** Gill, 1863.

FAO Names : En - Tusk (= Cusk); **Fr** - Brosme; **Sp** - Brosmio.

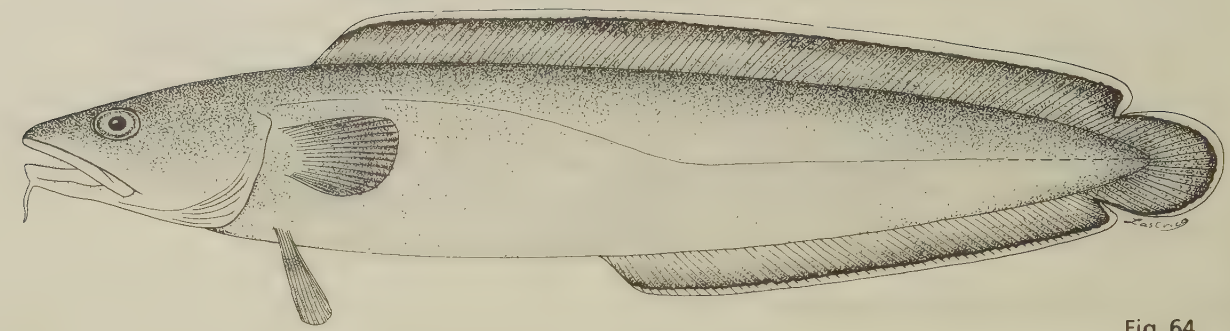


Fig. 64

(after Bigelow & Schroeder, 1953)

Diagnostic Features : Upper jaw slightly longer than lower. Barbel present on chin; none on snout. Single, long-based dorsal and anal fins, partly connected at their posterior ends to the rounded caudal fin; pectoral fin falling far short of anal fin origin. No elongated rays in the fleshy pelvic fin. Lateral line continuous until slightly before the caudal peduncle. Lateral line pores present on head. **Colour:** variable; dorsally dark red-brown or green-brown to yellow shading into pale colour on belly. Young fish may have six transverse yellow bands on sides. The most characteristic colour pattern is on the vertical fins, which have dark margin rimmed with white.

Geographical Distribution : Western north Atlantic from New Jersey to the Strait of Belle Isle and on the Grand Banks of Newfoundland. Rare at the southern tip of Greenland. Found off Iceland, in the northern North Sea, and along the coasts of Scandinavia to the Murmansk Coast and at Spitzbergen (Fig. 65).

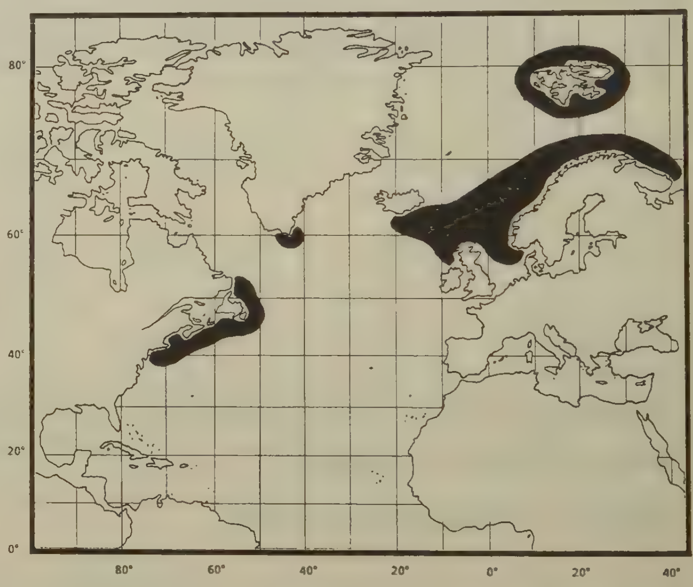


Fig. 65

Habitat and Biology : The tusk lives alone or in small shoals on rough, rock, gravel, or pebble bottoms of both sides of the North Atlantic. In the Gulf of Maine, it is occasionally found on mud with hakes, and in Norwegian waters, it often lurks among gorgonian corals. Seldom found on smooth, clean sand.

Generally keeps far from the shore, near the bottom, at depths from 20 to 1 000 m, mostly between 150 and 450 m in the northeastern Atlantic (except in the Faeroe Channel where it has been caught at 954 m), and between 18 and 549 m in the northwestern Atlantic. Never found near the shore or at depths of less than 20-30 m. It tolerates a temperature range from 0 to 10°C.

The tusk moves little from bank to bank and there is no definite evidence of seasonal onshore or offshore migrations. While remaining in the same region, it undertakes only local migrations from greater to lesser depths. It is found alone or in small aggregations, not forming large schools such as do other gadoids.

First maturity is reached at 8-10 years (50 cm length). Tusk is among the more prolific of fishes and a female of medium size can lay up to 2 million eggs which develop close to the surface. Spawning occurs in spring and early summer (April to July) on both sides of the Atlantic. Spawning grounds are distributed practically throughout the entire range, but the most important ones are between Scotland and Iceland. In the eastern Atlantic, they are located on the edge of the Shetland Islands, Faeroes and Iceland slopes, from 200 to 500 m depth, and in the northern part of the North Sea, along the 100-200 m isobaths. However, in the Gulf of Maine, the chief production of eggs probably takes place in shallower waters (but not less than 50 m) since most of the stock lives in lesser depths there. Some individuals probably even spawn close inshore in Cape Cod, Provincetown Harbour, and the Isles of Shoals. Up to 5 cm length, young are pelagic, then becoming benthic.

The growth rate is slow: at age 6 the fish is about 22 cm; at 7 it varies from 26 to 37 cm; at 8 from 36 to 48 cm; and at 15 from 60 to 80 cm. It lives for a maximum of about 20 years.

It feeds mostly on crustaceans and shellfishes, and also on benthic fishes (flatfishes and gurnard) and even on starfishes.

Size : The maximum size is 110 cm although cusk is more common from 60 to 95 cm in the eastern, and from 50 to 80 cm in the western North Atlantic.

Interest to Fisheries : The total catch reported in the FAO Yearbook of Fishery Statistics for 1987 is 46 254 metric tons. Tusk is fished by Canada (3 960 t in 1987) and USA (1 390 t in 1987) in the North West Atlantic, especially in the Gulf of Maine. Off Cape Cod, it is mostly caught incidental to cod fishing. In its eastern distribution, it is mostly taken by Norway (30 082 t in 1987), Faeroe Islands (6 600 t), Iceland (2 984 t), with major fishing grounds off the north coast of the British Isles, Denmark, the Northern part of the North Sea, Kattegat to Iceland, and the Murmansk coast. Along USSR shores, it is rare and cannot be considered a commercial fish.

The decreased landings of the North American fisheries in recent years are due to the change from longlining to otter trawls; tusk is not a good trawl fish since it frequents rough bottoms.

Tusk is caught with otter trawls and on hard bottoms, with longlines. It is also taken in the Gulf of Maine by sportsmen fishing for groundfish in general.

Utilization: fresh or frozen as fillets, but also dried, salted, and in brine.

Local Names : BELGIUM: Lom; CANADA: Cusk, Torsk, Tusk; DENMARK: Brosme; FRANCE: Brosme; GERMANY : Lumb; NETHERLANDS: Lom; NORWAY : Brosme; SWEDEN : Lubb, Lumb; UK: Cusk, Torsk, Tusk; USA: Cusk, Torsk, Tusk; USSR : Menek, Menyok.

Literature : Bigelow & Schroeder (1953); Andriashev (1954); Svetovidov (1962); Leim & Scott (1966); Quero (1984).

Ciliata

GADI Cil

Genus with Reference : ***Ciliata*** Couch, 1832, Mag.nat.Hist., 5:15.

Diagnostic Features : A barbel on chin and four or more barbels on snout. First dorsal ray followed by a row of small, fleshy filaments; anal fin single, not indented; pectoral fin falling far short of anal fin origin. Lateral line interrupted along its entire length.

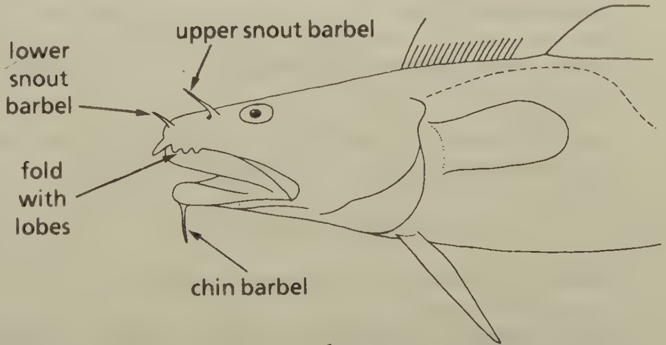
Habitat, Distribution and Biology : Found in the northeastern Atlantic, from the intertidal zone to 90 m depth, living on the bottom.

Interest to Fisheries : Practically none.

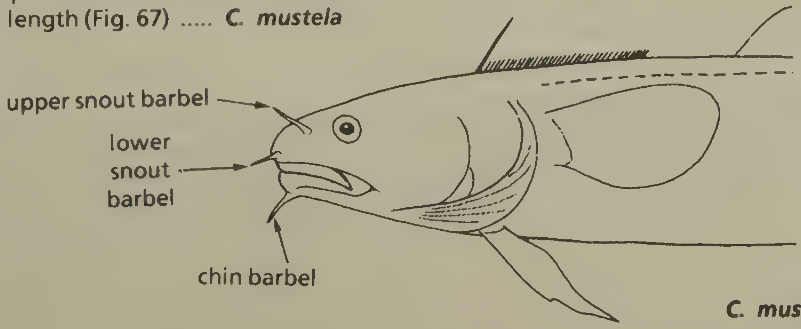
Key to species:

1a. A fold of skin above the upper lip with three pairs of lobes or snout barbels. Head less than five times in standard length (Fig. 66) .... *C. septentrionalis*

1b. No fold of skin with lobes or barbels above the upper lip. Head more than five times in standard length (Fig. 67) ..... *C. mustela*



C. septentrionalis Fig. 66



C. mustela Fig. 67

Ciliata mustela (Linnaeus, 1758)

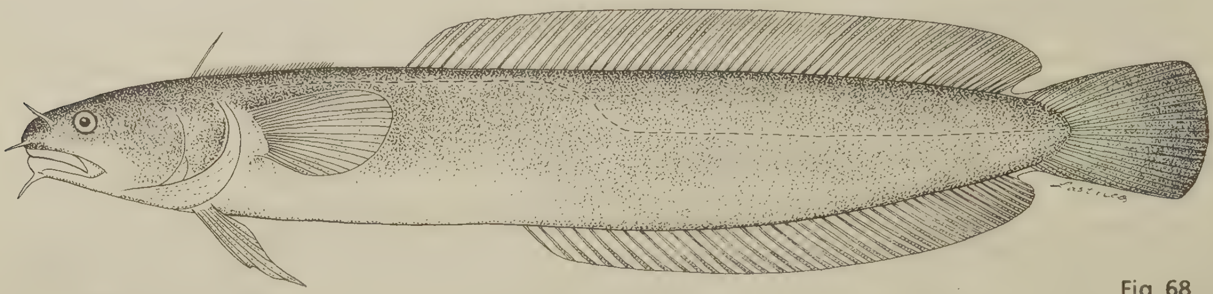
Fig. 68

GADI Cil 1

Scientific Name with Reference : ***Gadus mustela*** Linnaeus, 1758, Syst.Nat., ed X:255

Synonyms : ***Ciliata glauca*** Couch, 1832; ***Motella (Couchia) argenteola*** Duben & Koren, 1846; ***Enchelyopus mustela,*** Gronow, 1854; ***Couchia minor*** Thompson, 1856; ***Couchia glauca,*** Thompson, 1856; ***Molvella borealis*** Kaup, 1858; ***Motella mustela,*** Moreau, 1881; ***Onos mustela,*** Smitt, 1893; ***Gaidropsarus mustela,*** Lozano Rey, 1960.

FAO Names : En - Fivebeard rockling; **Fr** - Motelle à cinq barbillons.



(after Svetovidov, 1948)

Fig. 68

Diagnostic Features : Head relatively small, more than five times in standard length. No lobed fold of skin above upper lip. **Colour :** dark brown dorsally, reddish to blackish shading to pale grey-brown ventrally.

Geographical Distribution : From Lisbon north to Finnmark, around the British Isles, in the Skagerrak and Kattegat and Iceland (Fig. 69).

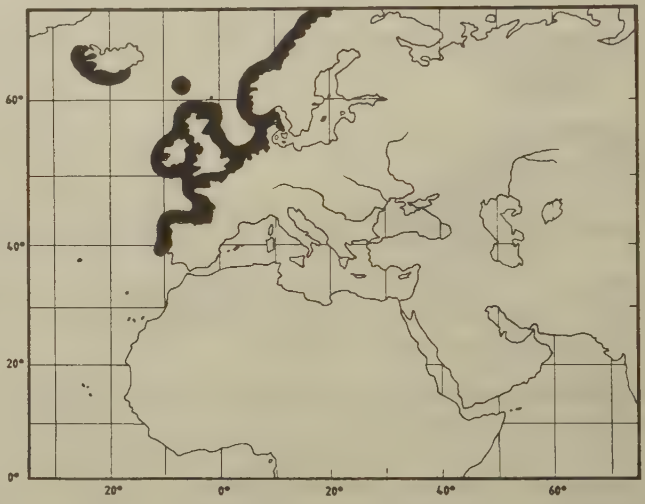


Fig. 69

Habitat and Biology : A common fish in the intertidal zone. Generally keeps close to the shore, not descending to great depths beyond the limits of the distribution of green algae (20 m), preferring rock bottoms but also living on sandy, muddy, and shell gravel bottoms.

Both males and females reach first maturity at 1 year and depending on their size, females lay 9 000 to 30 000 eggs. Breeds in deeper waters from February to May off the West Irish coast. Eggs and larvae are pelagic.

Female growth rate is higher than that of males: at 1 year, females are 14 cm long and males 11-13 cm, and at 2 years , they measure 20 and 17 cm respectively. Lives up to 3 years.

Feeds on crustaceans, mostly isopods, amphipods, crabs, shrimps, copepods and ostracods. Sometimes also on algae, polychaetes, gastropods and occasionally, small fish.

Size : Maximum to 25 cm total length.

Interest to Fisheries : No commercial value.

Local Names : BELGIUM: Lompje, Zeepuitaal; DENMARK: Femtradet Hawkvabbe; FRANCE: Motelle à cinq barbillons; GERMANY: Fünfbärtelige Seequappe; NETHERLANDS: Lompje, Zeepuitaal; NORWAY: Firtraadet Tang-Brosme; UK: Fivebeard rockling.

Literature : Svetovidov (1948); Wheeler (1969, 1978); Quero (1984).

Ciliata septentrionalis (Collett, 1875) Fig. 70

GADI Cil 2

Scientific Name with Reference : ***Motella septentrionalis*** Collett, 1875, Ann.Mag.nat.Hist., (4)15:82

Synonyms : ***Onos septentrionalis,*** Collett, 1880; ***Gaidropsarus septentrionalis,*** Collett, 1903.

FAO Names : En - Northern rockling.

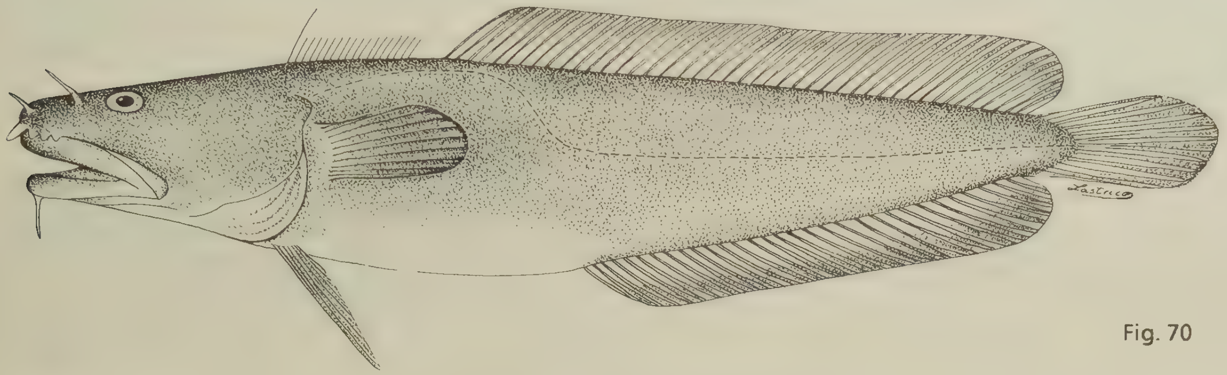


Fig. 70

Diagnostic Features : Head relatively large, less than five times in standard length. A fold of skin above the upper lip with three pairs of lobes or small barbels. In males, the jaw extends well past the eye; in females, only slightly past the eye.

Geographical Distribution : Around the British Isles and northward along the European coast to northern Norway; also at the Faeroe Islands and Iceland (Fig. 71).

Habitat and Biology : From the sublittoral zone to 90 m depth, but most common from 10 to 50 m on rock, sand or mud bottoms.

Size : Reaches 20 cm total length.

Interest to Fisheries : Practically none.

Local Names : NORWAY: NordiskTangbrosme; UK : Northern rockling.

Literature : Wheeler (1969, 1978).

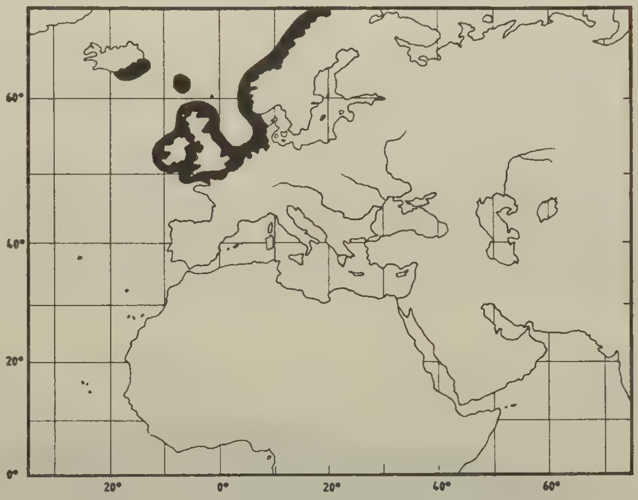


Fig. 71

Eleginus

GADI Ele

Genus with Reference : ***Eleginus*** G. Fischer, 1812-13, Mem.Soc.Nat.Moscou, 4:252-57

Diagnostic Features : Upper jaw slightly longer than lower. Three dorsal and two anal fins, distinctly separated from each other; first anal fin base short, less than one-half of preanal distance; pectoral fins falling short of anal fin origin; pelvic fins with a slightly elongated ray; rear margin of caudal fin nearly straight. Lateral line continuous to about origin of second dorsal fin. Head lacking lateral-line pores. Tips of parapophyses on some vertebral centra swollen and hollow, containing outpouchings of swimbladder.

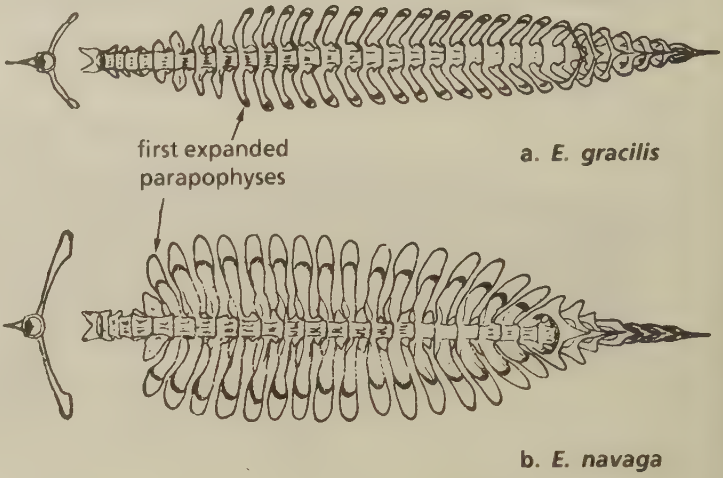
Habitat, Distribution and Biology : Coastal areas to 60 m depth. Also found in brackish to fresh tidal waters. Boreal North Pacific and adjacent Arctic waters, including Arctic coast of Europe.

Interest to Fisheries : Abundant fishes in some parts of their range.

Key to species:

1a. Expanded parapophyses begin on about centrum 9 or 10 (Fig. 72a). Gill rakers on first arch 14 to 25 .... ***E. gracilis***

1b. Expanded parapophyses begin on about centrum 5 (Fig. 72b). Gill rakers on first arch 19 to 31 .... ***E. navaga***



Ventral view of vertebral column showing parapophyses
(from Svetovidov, 1948)

Fig. 72

Eleginus gracilis (Tilesius, 1810)

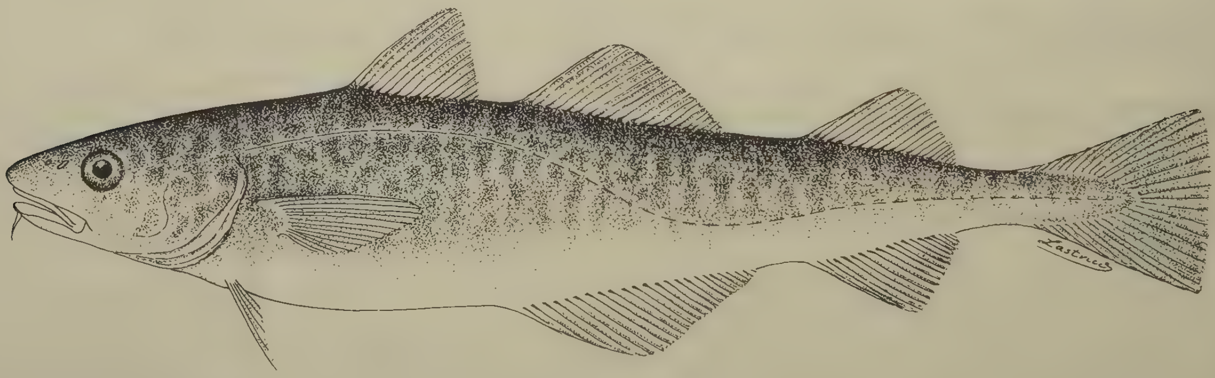
Fig. 73

GADI Ele 1

Scientific Name with Reference : ***Gadus gracilis*** Tilesius, 1810, Mem.Acad.Sci.Petersb., 2:354

Synonyms : ***Gadus wachna*** Pallas, 1811; ***Eleginus navaga gracilis,*** Schmidt, 1904.

FAO Names : En - Saffron cod; **Fr** - Morue boréale; **Sp** - Bacalao boreal.



(after Masuda et al., 1984)

Fig. 73

Diagnostic Features : Expanded parapophyses beginning on about vertebral centrum 9 or 10 swollen and hollow, containing outpouchings of the swimbladder; gill rakers 14 to 25. **Colour :** dorsally dark grey-green to brown, mottled; pale ventrally.

Geographical Distribution : North Pacific from the Yellow Sea in the southwest to Sitka in the southeast. Beyond the Bering Strait in the Chukchi Sea and east to Dease Strait (south coast of Victoria Island). Precise delimitation of the range depends on additional taxonomic study (Fig. 74).

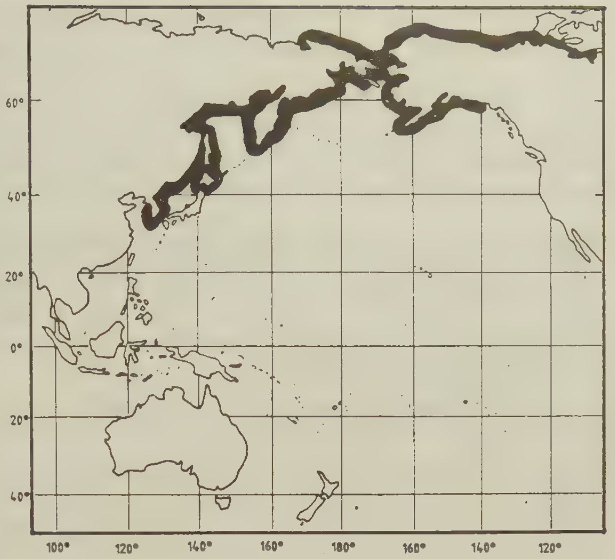


Fig. 74

Habitat and Biology : Occurs in shallow coastal waters at less than 60 m depth in the Arctic and western Pacific, and at less than 50 m depth in the northeastern Bering Sea and western Alaska, Norton Sound. It has been found, however, off northern Japan, on the continental shelf edge at 200 m depth. The Saffron cod also enters brackish and even fresh waters, occurring quite far up rivers and streams, but remaining within regions of tidal influence.

Migrations are not extensive. The juveniles are not migratory and stay in shallow water throughout the year, whereas adults undertake restricted seasonal migrations associated with spawning, feeding and changes in water temperature. The migration pattern could be summarized as winter inshore and summer offshore (or less inshore): in early winter, the fish move from the coast or estuaries into adjacent sand-pebble areas for spawning. After spawning, they return to silty bottoms or estuarine areas where they feed. They spend the winter under the ice cover and in early spring, when the water warms up, they move offshore to the cold and highly saline waters of the open sea. However, the southern Kuril population spends the autumn-winter period in the open sea at depths of 100 to 200 m because the absence of temperature conditions necessary for spawning in August-October in the coastal shallow zone compels the fish to migrate into colder waters.

The Saffron cod begin to mature during their third year of life in Norton Sound, western Alaska. Similar observations made in the western Pacific, northern Tatar Strait, and northern Sea of Okhotsk report the first maturity to occur at 2 to 3 years of life for both sexes.

Fecundity varies with geographical region. It decreases from east to west in the European Arctic and from south to north in western Pacific waters. Furthermore, individual fecundity increases with body length, weight and age. In the Gulf of Sakhalin, a two year-old fish (17 cm length) has a minimum fecundity of 4 900 eggs while a 9 year-old individual (47 cm length) in the Gulf of Terpenie can lay a maximum of 680 000 eggs. Thus, the maximum fecundity is 139 times higher than the minimum. For example, a 20-35 cm fish along the USSR Pacific coast (Tatar Strait) has an estimated fecundity of 29 000-124 000 eggs.

The Saffron cod spawns once a year, 5 to 7 times in its life, and sometimes even 9-10 times for those fish that live up to 10-14 years. Throughout its distribution area, spawning occurs during January-February in coastal zones of bays and inlets, on sand -gravel substrate and in strong tidal currents, at depths of 2-10 m, with the exception of the Gulf of Terpenie stock that spawns at depths of 25-32 m. There are indications that the eggs are adhesive. Although spawning occurs at the same temperatures and salinities, larvae hatch out in early spring (April-May) in the Arctic or northernmost portions of the western Pacific, and somewhat later (during warming) in waters farther south, such as the Sea of Japan.

The growth rate differs by sex and depends on the amount of forage available. Highest growth rates occur in fish that mature earlier. Generally speaking, growth is relatively slow; it is somewhat faster in the western Pacific stocks (except in parts of the Sea of Okhotsk, where it is slow in comparison with some Arctic stocks) than in the Arctic ones, although they die younger. In the western Pacific distribution of the species, the size of a 3 year-old fish varies from 18.8 to 35.4 cm (mostly 29-35 cm), while in the Barents and Kara seas, it ranges between 16.5 and 20.7 cm. An 8-9 year-old fish in the western Pacific is about 53 cm long while the largest specimen found in Arctic waters was 44 cm . The rate of natural mortality is high, 60-80% annually, and less than 1% of the stock survives past 5 years. The maximum age decreases southward: 11-12 years in Yama inlet and the Gulf of Terpenie; 9-10 years in the other regions of Sakhalin; 7-8 years in Gulf of Peter the Great and off the southern Kurils.

Juveniles and adults are opportunistic epibenthic feeders; juveniles feed on fish, mysids, decapods, and amphipods. Feeding starts in summer and goes on until the winter spawning. It is then reduced and resumes in mid-winter after reproduction.

Size : Reaches at least 55 cm total length.

Interest to Fisheries : Taken commercially in many areas of the northwestern Pacific and harvested for almost 100 years. Until 1973, total catches fluctuated between 6 600-22 300 t annually, they increased continuously in recent years to an average of 39 000 t/year between 1977 and 1980. The major fishing grounds are in the western North Pacific: Peter the Great Bay, Sakhalin region, Sea of Okhotsk and Kamchatka waters. Fishing is carried out during late autumn and winter by the USSR and, in Norton Sound, by Alaskan fishermen. Fishing gear used are not highly mechanized and include hook and line, beach and danish seines, gill nets, hoop-nets, fyke nets, and trawls. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics is 27 929 t, all taken in the northwestern Pacific by USSR.

The size of the saffron cod does not permit its substitution into existing Pacific cod and walleye pollock markets and costs would not permit it to be profitably used in the pet food industry. It is used for human consumption in USSR , fresh or frozen.

Local Names : USSR: Navaga.

Literature : Svetovidov (1965); Safronov (1981); Wolotira (1985).

Remarks : Taxonomic problems remain to be solved.

Eleginus navaga (Pallas, 1811)

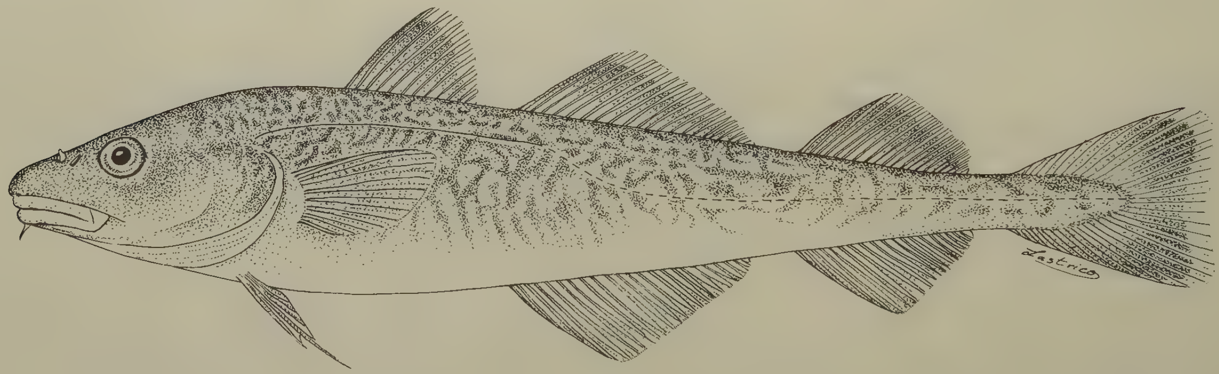
Fig. 75

GADI Ele 2

Scientific Name with Reference : ***Gadus navaga*** Pallas, 1811, Zoogr.-Rosso Asiat., 3:19.

Synonyms : ***Eleginus navaga navaga*** Esipov, 1941; ***Eleginus navaga karaensis*** Esipov, 1941

FAO Names : En - Navaga; **Fr** - Morue arctique; **Sp** - Bacalao del Artico.



(after Svetovidov, 1948) Fig. 75

Diagnostic Features : Expanded parapophyses beginning on about vertebral centrum 5, swollen and hollow, containing outpouchings of the swimbladder; gill rakers 19 to 31. **Colour:** brownish dorsally, with small dark blotches; pale ventrally.

Geographical Distribution : Arctic Ocean in the White, Barents and Kara Seas. Precise delimitation of the range depends upon additional taxonomic research (Fig. 76).

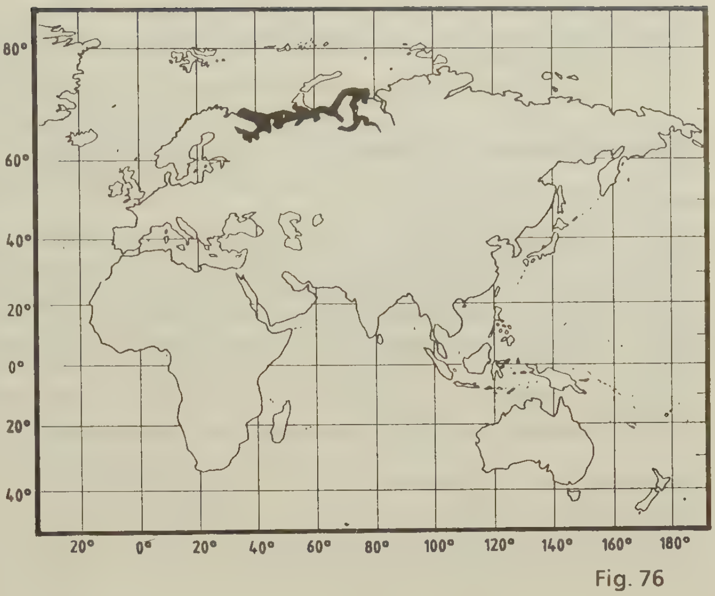


Fig. 76

Habitat and Biology : Lives in the coastal, sublittoral zone of the White Sea and Arctic coasts of Europe where it reflects a broad adaptation to the ecological conditions of the Arctic. It is found at shallow depths, along shores with soft ,muddy bottoms, close to the ice and on the continental shelf. It sometimes forms large schools under the ice. It is often caught in greatly freshened and at times completely fresh water, entering the mouths and tidal zones of rivers and traveling upstream. Not found in the open sea or at great depths.

This species does not undertake extensive migrations except for daily feeding.

Reaches sexual maturity in the third or fourth year. Females produce between 6 000 and 90 000 eggs per year.

In winter, before spawning, it gathers in great numbers close to shore, and enters the mouths and upper parts of rivers into areas that are under tidal influence. For spawning, the Navaga moves from the shores and river mouths to greater depths (8-10 m) over sandy or rocky bottoms, usually in January. Spawning sites are distributed in channels between islands or in depressions between the shore and shallow banks with strong tidal currents.

Eggs sink to the sea-bed, but are not adhesive. Development of the eggs occurs only in salt water; they perish in fresh water.

Under normal temperature conditions, the main mass of spawning Navaga consists of 2 to 4 year- olds whose dimensions are: 18 cm total length at 2 years, and 21 cm (Unshaya Inlet) at 3 years. Usual sizes in the White Sea are 15-23 cm, but the species reaches 35 cm and more; in Mezen Bay at the western shores of Kanin Peninsula, it attains the greatest size (to 40-42 cm) and age (7 years). Sizes are not always identical over the entire region; the Dvina Bay stock grows slower and fish are smaller than those from other White Sea bays. Apparently, in the other bays, local races or schools are formed.

It feeds mainly on crustaceans and worms, but eats small fishes as well, including stickleback, capelin, sandeels, saika, small cod, flounder, and navaga, which play the greatest role in the sustenance of larger navaga. In summer, with the rise of water temperature to 10°C and higher, they eat very poorly. It is in turn eaten by a wide range of larger fishes and Arctic mammals, and young are preyed upon by sea-birds.

Size : Reaching at least 42 cm total length.

Interest to Fisheries : Navaga is commercially fished by the Soviet fleet in the White Sea with "ryuzh" (local name for a type of net used in northwestern Russia) and partially on hook and line. The industrial catch takes place during mass gatherings for spawning beneath the ice, near shore. It begins in November and the greatest catches coincide with the peak of spawning in January, after which hungry, post-spawning Navaga are caught and the catch figure drops rapidly. Main fishing grounds are Dvina, Onega and Mezen bays of the White Sea and Cheshskaya Inlet.

In the past, the greatest quantity of Navaga was caught in Mezen Bay along the western coast of Kanin Peninsula, but in recent years, its numbers have greatly diminished. The total catch reported for 1987 in the FAO Yearbook of Fishery Statistics was about 3 765 metric tons, all taken by USSR in the Arctic Ocean (Fishing Area 27).

Local Names : USSR: Navaga.

Literature : Svetovidov (1948, 1965); Wheeler (1969); Girsa (1986).

Remarks : Taxonomic problems remain to be solved.

Enchelyopus

GADI En

Genus with Reference : ***Enchelyopus*** Bloch & Schneider, 1801, Syst.Ichthyol., 950.

Diagnostic Features : See species.

Remarks : A single species.

Enchelyopus cimbrius (Linnaeus, 1776)

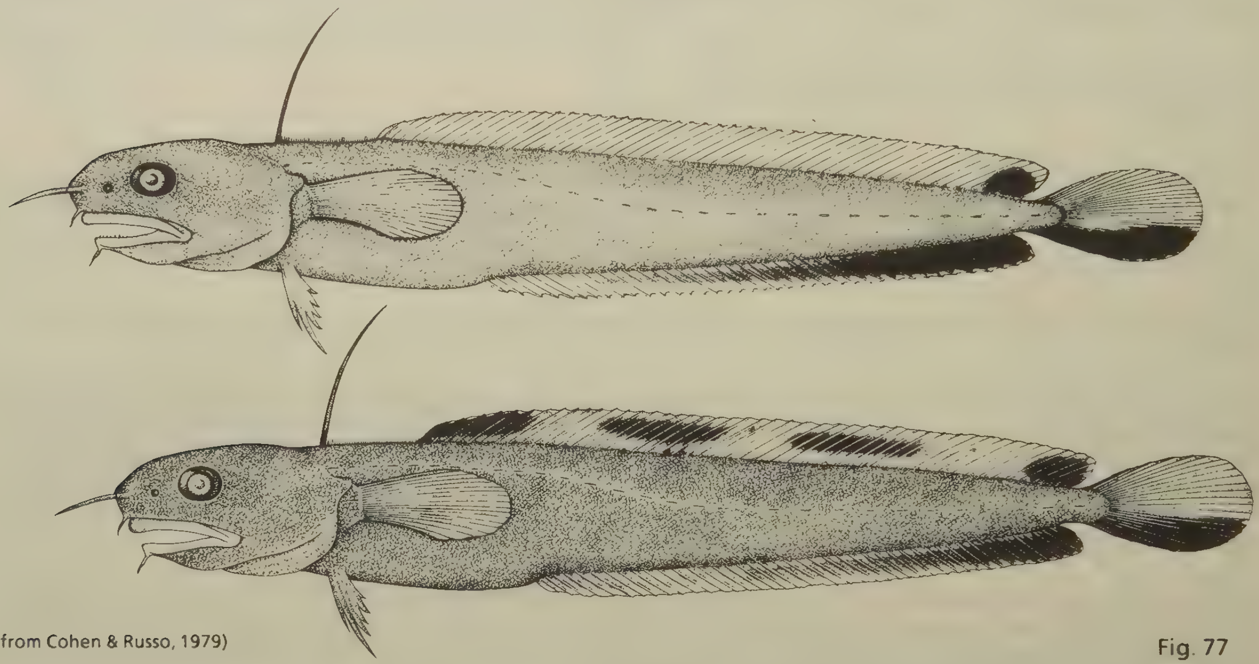
Fig. 77

GADI En 1

Scientific Name with Reference : ***Gadus cimbrius*** Linnaeus, 1776, Syst.Nat., ed 12:440

Synonyms : ***Motella cimbrica*** Nilsson, 1832; ***Motella caudacuta*** Storer, 1848; ***Rhinonemus caudacuta,*** Gill, 1864; ***Couchia edwardii*** Couch, 1866; ***Rhinonemus cimbrius***, Jordan, 1885; ***Gaidropsarus cimbrius,*** Collett, 1903.

FAO Names : **En** - Fourbeard rockling; **Fr** - Motelle à quatre barbillons.



(from Cohen & Russo, 1979)

Fig. 77

Diagnostic Features : One barbel present on chin, one on tip of snout, and one at each of the anterior nostrils. First dorsal ray followed by a row of small, fleshy filaments; anal fin single, not indented. Lateral line interrupted along its entire length. **Colour:** variable, dusky to pale. Fin pigment varying geographically in the western Atlantic, with more dark blotches on southern fishes, fewer on northern ones.

Geographical Distribution : Northern Gulf of Mexico to Newfoundland, western Greenland, coasts of Europe and the British Isles from the Barents Sea to the northern Bay of Biscay, one locality at Cape Blanc, Mauritania (Fig. 78).

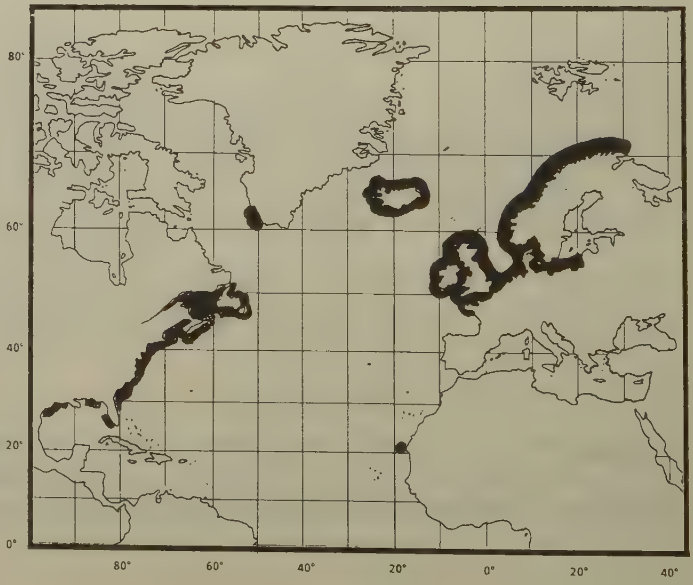


Fig. 78

Habitat and Biology : Adults are mainly sedentary bottom dwellers on muddy sand between patches of hard substrate, or on the soft, smooth ground of deep sinks on the continental slopes of both sides of the North Atlantic. Although quite often found in very shallow water near the shore, its depth range extends from 20 to 650 m (most commonly from 20 to 50 m); it has once been reported from 1 325 m depth in the Gulf of Maine (Goode & Bean, 1896), but this record has not been verified by recent workers.

The presence of rockling in very shallow waters suggests that it migrates inshore in winter and autumn, and back to deeper waters in spring and summer. Apart from these small displacements, it seems to be a year-round resident wherever it is found, and there is no reason to suppose that adult fish ever rise far above the bottom.

First maturity is reached at 3 years (at about 15 cm total length). Depending on their size, females lay 5 000 to 45 000 eggs. The limits of the spawning season are not definitely known, but it seems to be very prolonged, from January to August) or even to September/October; on the coast of Canada, Norway, western Ireland and Iceland, it ranges from June to September inclusive; in the periphery of the Gulf of Maine, where Massachusetts is an important nursery, from May to October. Spawning has been recorded in waters less than 140 m deep. The silvery pelagic larvae are similar to those of ***Urophycis*** species.

Growth is relatively slow; at 3 years of age, total length is 15 cm, at 5 years, 20 cm, and at 7 years, 25 cm. Maximum age is 9 years (at about 29 cm length) in the eastern Atlantic, and at 30.5 cm in the western Atlantic.

Feeds on small fish (young flatfishes) and crustaceans (amphipods, decapods, copepods, mysids) in the eastern Atlantic, and in the western Atlantic mostly on shrimps, isopods and other small crustaceans, but less often on young fish.

Size : Reaches about 41 cm, but generally less than 30 cm.

Interest to Fisheries : Separate statistics are not reported to FAO. Taken with trawls, but it does not have great economical value since it is neither large, nor abundant. Used hot-smoked, in "Ukha" soups, and other products.

Literature : Bigelow & Schroeder (1953); Svetovidov (1948); Wheeler (1978); Cohen & Russo, (1979); Quero (1984).

Gadiculus

GADI Gadi

Genus with Reference : ***Gadiculus*** Guichenot, 1850, Explors.Sci.Algérie,Zool., 5:101

Diagnostic Features : See species.

Remarks : A single species.

Gadiculus argenteus Guichenot, 1850

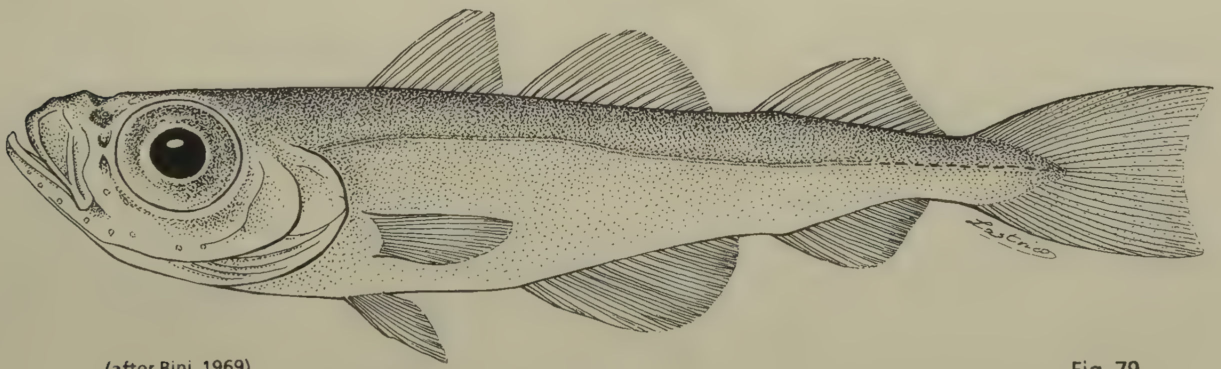
Fig. 79

GADI Gadi 1

Scientific Name with Reference : ***Gadiculus argenteus*** Guichenot, 1850, Explors.Sci.Algérie,, 5:102

Synonyms : ***Merlangus argenteus,*** Vaillant, 1888.

FAO Names : En - Silvery pout; **Fr** - Merlan argenté; **Sp** - Faneca plateada



(after Bini, 1969)

Fig. 79

Diagnostic Features : Eye large, greater in diameter than length of snout. Mouth oblique. Chin barbel absent. Dorsal fins three, separate. Anal fins two, separate; base of first short, less than one-half of preanal distance; pectoral fin falling short of anal-fin origin; no long rays in pelvic fin. Lateral line continuous to middle of third dorsal fin; lateral-line pores present on head. **Colour:** pink to light brown dorsally, silvery on sides and ventrally.

Geographical Distribution : Eastern Atlantic from North Cape (Norway) to Morocco, and western Mediterranean (Fig. 80).

Habitat and Biology : The silvery pout is a deep-water, open-sea epi- to mesopelagic fish common over the edge of the continental shelf. It occurs in large schools over mud, muddy sand, gravel and rock bottoms, from 110 to 1 000 m depth, but mostly from 200 to 400 m in the northern Mediterranean and from 300 to 600 m off Tunisia.

It breeds from December to January in the Mediterranean, and from mid-winter to spring in northern Europe. The major spawning grounds are located in the western part of the Mediterranean, on both sides of the Straits of Gibraltar, in deep water.

Silvery pout rarely lives up to 3 years, when it reaches a maximum length (15 cm); most commonly, it attains 13 cm in its northern distribution, and 7 to 10 cm in the Mediterranean Sea.

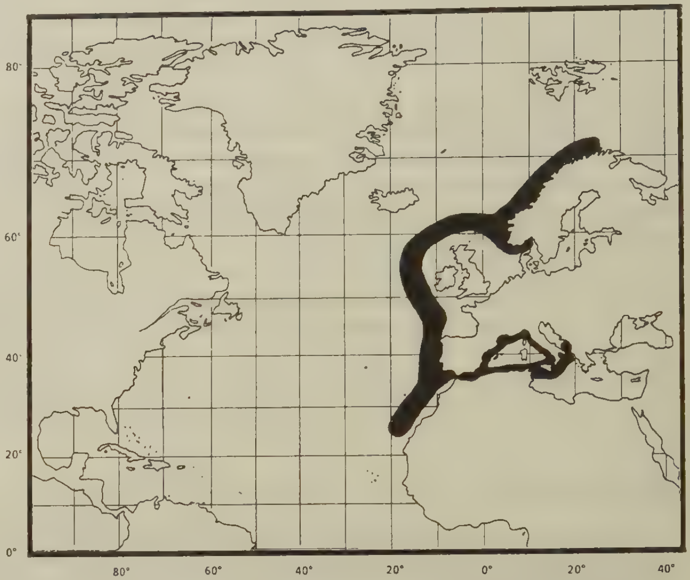


Fig. 80

Feeds on small crustaceans and possibly on worms. It is preyed upon by a number of larger valuable fish.

Size : Reaches 15 cm total length, common from 7 to 10 cm.

Interest to Fisheries : Silvery pout is of no particular economic importance and is usually by-caught in small-scale and artisanal bottom trawling fisheries off Spain and Sicily.

It is sold fresh (Moroccan markets); also or used for fishmeal or bait.

Local Names : CYPRUS: Bacaliaraki; FRANCE: Gadicule argenté; GREECE: Gadíkoulos; ITALY: Pesce fico; MALTA: Nemusa; USSR: Bolsheglazaya tresochka; YUGOSLAVIA: Ugotica srebrenka.

Literature : Schmidt (1914); Svetovidov (1948); Bini (1969); Wheeler (1978).

Remarks : Divided into two subspecies, ***G. argenteus argenteus*** from the western Mediterranean and the Atlantic around the Straits of Gibraltar and to the south along the Moroccan coast, and ***G. argenteus thori*** from the Bay of Biscay to west of the British Isles and along the Scandinavian coast to North Cape.

Gadus

GADI Gadu

Genus with Reference : ***Gadus*** Linnaeus, 1758, Syst.Nat., ed X:251.

Diagnostic Features : Lower jaw shorter than upper; palatine teeth lacking. Chin barbel well developed. Three dorsal fins, two anal fins, all separate from each other; first anal fin base short, less than one-half of preanal distance; pectoral fins falling far short of anal fin origin; pelvic fins with a slightly elongated filament. Lateral line pale, continuous for at least mid-length of third dorsal fin, interrupted to end of caudal peduncle; lateral line pores present on head. Scales overlapping.

Habitat, Distribution and Biology : Benthic to benthopelagic at depths to 500 m. Some races tolerate low salinities. Circumboreal, extending into the Arctic to the north of Scandinavia and Europe.

Interest to Fisheries : Very important to fisheries. Reported landings for 1987 were 2 500 000 metric tons of which 2 054 721 t were ***G. morhua***.

Remarks : The genus ***Gadus*** as originally used by Linnaeus (1758) and early ichthyologists contained numerous species. Through the years, many different genera were proposed for various of the ***Gadus*** species. The culmination of this shrinking of ***Gadus*** was reached in 1948 when Svetovidov, in his comprehensive monograph of the Gadidae, recognized only a single species in the genus, ***G. morhua***. He was aware, however, that morphologically different populations existed in nature, and he treated some of them as six different subspecies. In general, Soviet ichthyologists have followed Svetovidov, while most others have tended to recognize at least some of his subspecies as full species. This is neither an appropriate place to discuss the theoretical differences between the two categories nor to analyze Svetovidov's subspecies in the light of theory. The present compilation agrees with Renaud (1989) in recognizing three full species, although the question is not yet completely settled. Additional information is presented in the diagnoses and remarks sections for the species.

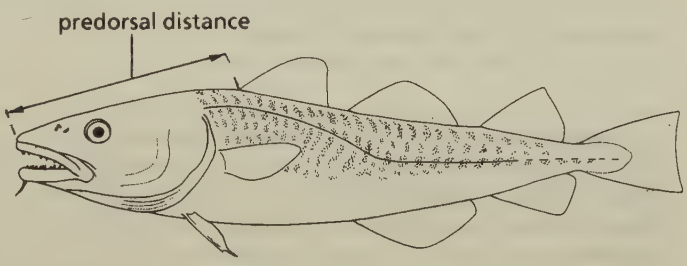
Key to species:

1a. Predorsal distance greater than about one-third of total length. Body generally spotted. Head relatively broad, interorbital space 18 to 25% of head length .... ***G. macrocephalus*** (Fig. 81)

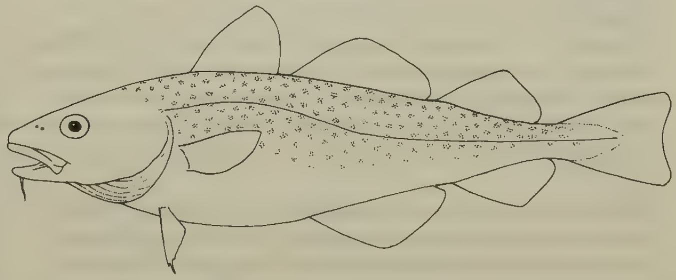
1b. Predorsal distance less than about one-third of total length

  2a. Body generally spotted. Head relatively narrow, interorbital space 15 to 22% of head length .... ***G. morhua*** (Fig. 82)

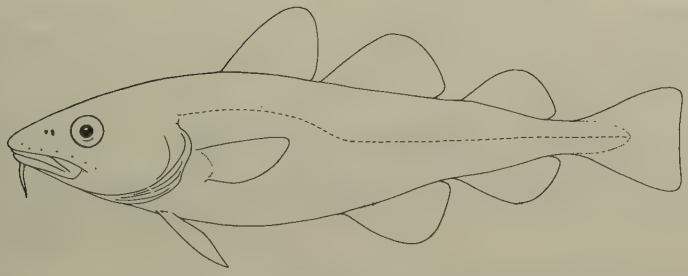
  2b. Body unspotted. Head relatively broad, interorbital space 18 to 25% of head length .... ***G. ogac*** (Fig. 83)



G. macrocephalus Fig. 81



G. morhua Fig. 82



G. ogac Fig. 83

Gadus macrocephalus Tilesius, 1810

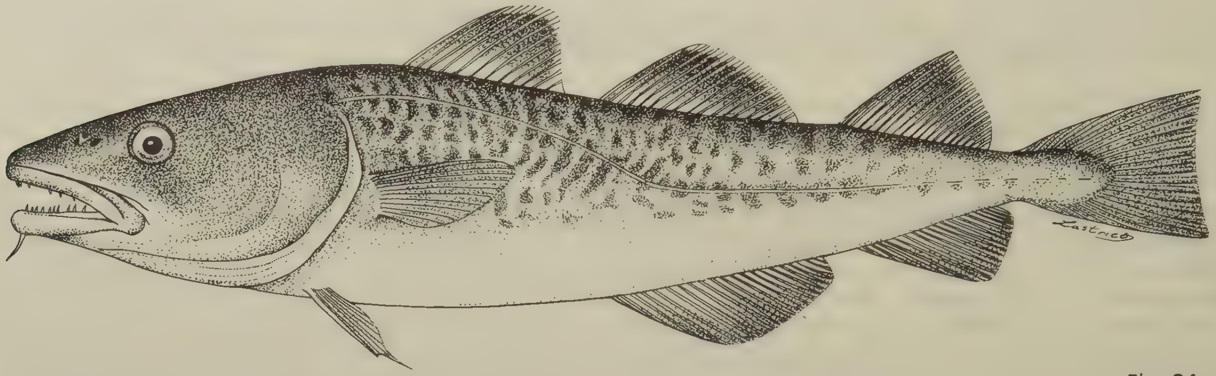
Fig. 84

GADI Gadu 1

Scientific Name with Reference : ***Gadus macrocephalus*** Tilesius, 1810, Mem.Acad.Sci.Petersb., 2:350

Synonyms : ***Gadus pygmaeus*** Pallas, 1811; ***Gadus auratus*** Cope, 1873; ***Gadus brandti*** Hilgendorf, 1875; ***Gadus callarias macrocephalus,*** Schmidt, 1904; ***Gadus morhua macrocephalus,*** Berg, 1933.

FAO Names : **En** - Pacific cod; **Fr** - Morue du Pacifique; **Sp** - Bacalao del Pacifico.



(after Svetovidov, 1948)

Fig. 84

Diagnostic Features : Head relatively broad; interorbital space 18 to 25% of head length. Predorsal distance more than about 33% of length; anterior part of swimbladder with 2 relatively short, horn-like extensions (Fig. 85). **Colour** : dorsally brown to grey with spots or vermiculations, ventrally paler.

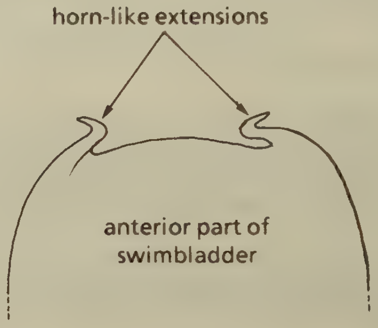


Fig. 85

Geographical Distribution : Found around the rim of the North Pacific, from the Yellow Sea to the Bering Strait, along the Aleutians, and south to about Los Angeles. Rather rare in the southern part of its range. (Fig. 86)

Habitat and Biology : Lives mainly along the continental shelf and upper slope of the North Pacific in the areas bordered by Korea and the western Chukchi Peninsula in the west, and Norton Sound and Oregon in the east. Its bathymetric range extends from shallow water (10 m) to about 550 m, but it is mostly between 100 and 400 m in the Gulf of Alaska and the Bering Sea. Some cod are assumed to be pelagic over deep water.

The distribution in the eastern Bering Sea varies between years and seasons within years. The driving environmental variable behind the changes in distribution appears to be water temperature, with such biological factors as year-class abundance and age composition, and probably spawning and feeding migrations also playing important roles.

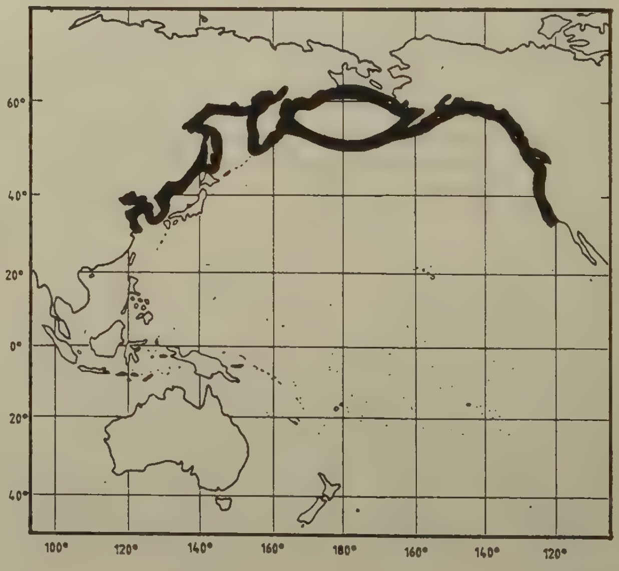


Fig. 86

Spawning migrations have been definitely linked to annual changes in temperature of the ocean in various parts of the geographical range. Pacific cod does not undertake migrations as extensive as the Atlantic species but moves only for short distances, such as to and from the shore, or from one bank to the other within a limited region. In summer, schools are small and distinct, contrarily to the large aggregations formed by the Atlantic cod. In the western Pacific, there appear to be two general types of schooling behaviour in cod of similar size and state of maturity: a school that is more or less permanent on the grounds and a school that moves continually. These two types of schools could be observed along the western shores of Kamchatka in two parallel rows, one at depths of 10-50 m, the other at 70-100 m. Near the end of September, or at the beginning of October, fish of the shallow row retreat to greater depths where they mix with those of the deeper row, and subsequently, they all proceed to 150-250 m depth where they remain for the winter.

In the eastern Bering Sea and regions of Kamchatka and the Sea of Okhotsk, Pacific cod move off the inner and central shelf regions as summer ends, concentrate in deeper water on the outer shelf and along the shelf edge during winter (in response to the autumn-winter drop in temperatures in the littoral waters), migrate back toward the inner shelf as the ice pack recedes northward in the spring (post-spawning/feeding migration), and are broadly dispersed over much of the inner and central shelf, as well as the outer shelf and along the continental slope, during the summer.

Age and size at first maturity vary with areas, the southern stocks maturing at an earlier age. They are, respectively, for males and females: 2-3 years and 40 to 44 cm off Washington, 3 years and about 50 cm in the Gulf of Alaska and in the Bering Strait, and 5 years and about 67 cm off Rebun Island, Hokkaido.

In the eastern Bering Sea, the proportion of females increases with size from 43.3% at 10 to 20 cm length to 61.6% at more than 60 cm. The overall sex ratio and size-specific differences for cod in the eastern Bering Sea are similar to those for the cod in the horthwestern Bering Sea, where the sex ratio is nearly 1:1, with males dominating in the younger age groups, and females in the older age groups.

Fecundity ranges from 860 000-6 400.000 eggs per individual, depending also on environmental conditions: in the far eastern areas, the range is 1 400 000-6 400 000 eggs; in Hokkaido waters, 3 000 000-4 000 000 eggs; in Mutsu Bay (northernmost Honshu), 1 500 000-2 000 000 eggs. In the Straits of Georgia (southern British Columbia), females of 60-78 cm produce 1 200 000 to 3 300 000 eggs; in the Gulf of Alaska the fecundity ranges from 860 000-3 000 000 eggs, and in the Bering Sea, from 1 000 000-2 000 000 eggs. Females spawn only once each season. The eggs are demersal and slightly adhesive.

The spawning season extends from winter to early spring. In the western Pacific, around the Commander Islands and along the coast of Siberia, spawning occurs from January to May. Spawning time differs between Japan and the Sea of Okhotsk because of differences in the cycles of the oceanographic climate: in the warmer regions such as Japan and Korea, the fish remain at greater depths during summer (up to 200 m), and when temperatures drop during autumn, they move into shallow water, and spawn during winter; in more northern regions, such as the Sea of Okhotsk, where the temperatures of littoral waters are very low during winter, cod move to considerable depths for over-wintering and spawn in March-April. Off West Kamchatka, cod move away from the ocean floor at the approach of the spawning period and concentrate at an intermediate depth. Spawning in the eastern Bering Sea is expected to take place within the period of January to April, when water temperature is higher than 0°C; the optimum temperature for hatching and survival is considered to be 5°C. Along the Alaska Peninsula and westward, spawning takes place in the warmer waters of the outer continental shelf and slope or in protected bays and adjacent ice-free waters. Off British Columbia and Washington, spawning areas in shallow water are located at about 53°N, where seasonal minimum bottom temperatures occur on inshore banks during winter. However, reproduction may be adversely affected by the relatively frequent occurrence of warm winters in this area. In the Gulf of Alaska, cod spawn from January to March along the continental slope of Alaska Peninsula.

It is hypothesized that spawning of Pacific cod must take place over a shorter period of time than that of the Atlantic species because of the greater instability in the Pacific marine temperatures.

Growth of Pacific cod is rapid during early stages. In the eastern Bering Sea, it has not been well identified because of problems in ageing the fish in the region. The southern Pacific stocks grow substantially faster than stocks of the colder regions of the North Pacific (such as the Bering and Okhotsk Seas), and growth is continuous throughout the year. Southern Pacific cod also mature at an earlier age and have a shorter life span (6-7 years). In Hecate Strait (northern British Columbia) cod length at age 1 is 23 cm; at age 2 it is about 44 cm; and the theoretical maximum length is 94 cm. Corresponding lengths, in the Straits of Georgia are 26, 49, and 76 cm; in the Bering Sea, 27.5, 43, and 84.5 cm (age 8), and in the Gulf of Alaska, 28.5, 47, and 85.5 cm. Although the fish usually grow to a maximum length of 85 cm, the greatest recorded length is 120 cm. The life span is normally 8-9 years, although in the western Pacific, they can live up to 12 years.

Pacific cod appear to be indiscriminate predators upon dominant food organisms present. They evidently feed very little when they are close to spawning.

The diet of adults includes fish, octopuses, and large benthic and bentho-pelagic crustacea such as the Kamchatka crab and shrimps. The fish species consumed include saffron cod, pollock, smelt, and herring, as well as flounders, cottids, salmon and sardines.

Size : Reaches 1 m total length.

Interest to Fisheries : The total catch reported in the FAO Yearbook of Fishery Statistics for 1987 totalled 441 107 metric tons. The Japanese catch, which had traditionally accounted for the largest component of the total landings of this species, has decreased substantially (because of intense exploitation) since the mid seventies, while the USSR catch has shown a rapid increase in recent years. It should be noted that the abundance of Pacific cod has increased substantially since 1977 as a result of the recruitment of the exceptionally strong year classes fo 1977-1978 and the good year classes of 1982 to 1985.

Combined catches of Pacific cod by the USA trawl fishery and joint-venture fisheries increased from less than 1 000 metric tons in 1979 to nearly 91 000 metric tons in 1984. In 1987, landings in the eastern North Pacific amounted to 207 490 metric tons (of which 136 900 t were taken by USA) and in the western portion, to 233 617 t (of which 175 271 t were taken by the Soviet Union).

Fishing fleets exploiting this species in decreasing order of catch are: USSR, USA, Japan, Canada and Republic of Korea. Pacific cod is often taken incidentally to pollack and flatfish fisheries, and in Korea it is exclusively a by-catch of other commercial fisheries.

Pacific cod is now the most important of the trawl-caught bottom fishes of British Columbia. In Canada and the northeastern Pacific, the major types of gear used are trawls, but also longlines, troll and handlines. It should be noted that although pollock, Pacific herring and smelt are chief food items for cod, these are reputedly worthless as bait. In Japan and Bering Sea, also Danish seines, and pair and stern trawls are used.

In all areas, the importance of cod in the catches declines with depth. Depths of greatest cod occurrence were generally between 91 and 273 m. There are higher proportions of large fish in the British Columbia and southeastern Alaska regions than in the Gulf of Alaska and the Bering Sea. In the eastern Bering Sea, cod are taken primarily on the outer continental shelf (about equally divided between the areas southeast and northwest of the Pribilof Islands), with highest catches occurring near the shelf edge.

Pacific cod has a high growth rate and high natural mortality and can support heavy exploitation. The catch is used mostly for filleting for subsequent production of fish sticks and fillet blocks.

Local Names : CANADA : Pacific cod; JAPAN: Ma-dara; USA : Pacific cod; USSR : Tikhookeanskaya treska.

Literature : Schultz & Welander (1935); Svetovidov (1948); Andriashev (1954); Wise (1961, 1963); Quast (1970); Hart (1973); Bulletin of Fisheries Resources Bd (1973); Niggol (1982); International North Pacific Fisheries Commission (1987); Fredin and Natural Resources Consultant (1985).

Remarks : Although the Pacific cod comprises a number of populations with different behaviour patterns, it is overall a biological species quite distinct from the Atlantic cod.

Gadus morhua Linnaeus, 1758

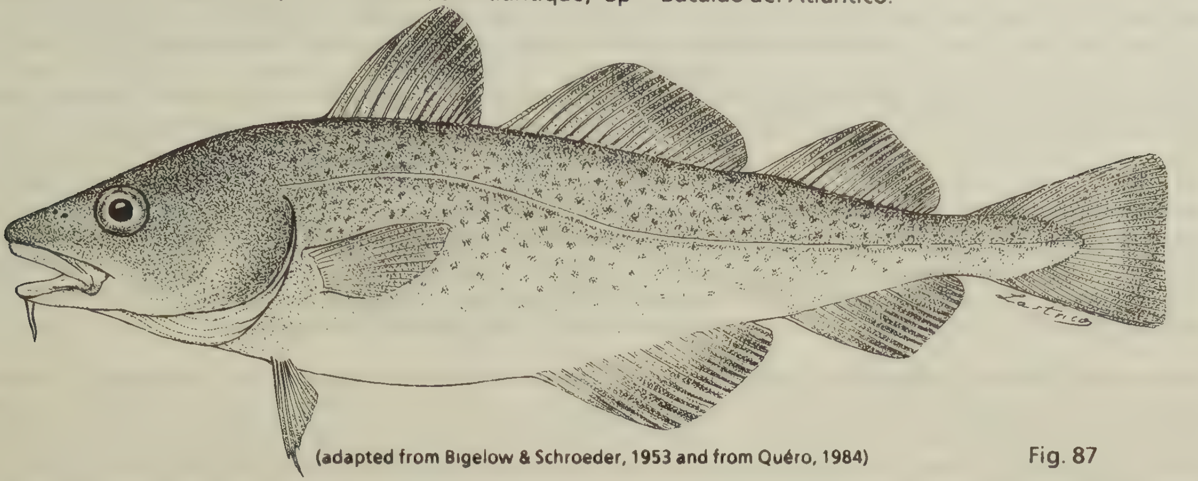
Fig. 87

GADI Gadu 2

Scientific Name with Reference : ***Gadus morhua*** Linnaeus, 1758 Syst.Nat., ed. X:252

Synonyms : ***Gadus callarius*** Linnaeus, 1758; ***Gadus vertagus*** Walbaum, 1791; ***Gadus heteroglossus*** Walbaum, 1792; ***Gadus ruber*** Lacépède, 1803; ***Morhua vulgaris*** Fleming, 1828; ***Gadus arenosus*** Mitchill, 1815; ***Gadus rupestris*** Mitchill, 1815; ***Morhua punctata*** Fleming, 1828; ***Gadus nanus*** Faber, 1829; ***Morrhua americana*** Storer, 1858; ***Gadus callarias kildinensis*** Derjugin, 1920; ***Gadus morhua kildinensis,*** Berg, 1933; ***Gadus morhua morhua,*** Svetovidov, 1948. The species name ***morhua*** is incorrectly spelled as ***morrhua*** by many authors.

FAO Names : En - Atlantic cod; **Fr** - Morue de l'Atlantique; **Sp** - Bacalao del Atlántico.



(adapted from Bigelow & Schroeder, 1953 and from Quéro, 1984)

Fig. 87

Diagnostic Features : Head relatively narrow, interorbital space 15 to 22% of head length. Predorsal distance less than about 33% of length; **Colour :** variable, brownish to greenish or grey dorsally and on upper side, pale ventrally. Peritoneum silvery.

Geographical Distribution : Cape Hatteras to Ungava Bay along the North American coast; east and west coasts of Greenland, extending for variable distances to the north, depending upon climate trends; around Iceland; coasts of Europe from the Bay of Biscay to the Barents Sea, including the region around Bear Island (Fig. 88).

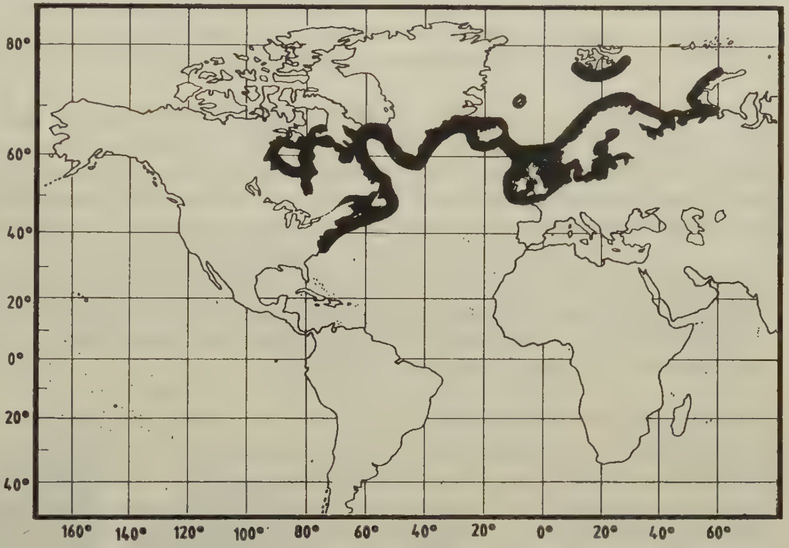


Fig. 88

Habitat and Biology : The Atlantic cod is generally considered a demersal fish, although its habitat may become pelagic under certain hydrographic conditions, when feeding or spawning. The presence of cod usually depends on prey distribution rather than on temperature. However, whatever the reason, larger fish are found in colder waters in most areas (0-5°C). It lives in almost every salinity from nearly fresh to full oceanic water, and in a wide range of temperatures from nearly freezing to 20C°.

This species is widely distributed in a variety of habitats from the shoreline to well down the continental shelf, to depths over 600 m, but is mostly found within the continental shelf areas from 150-200 m. Tagged cod at Jan Mayen, which have been recaptured on the spawning grounds around Iceland, indicate that these fish must have crossed in water over 1000 m deep. It is unlikely that cod swim as deep as this; although, they have been trawled in depths up to 460 m. While Atlantic cod is essentially a fish of the open sea, it appears regularly in various river mouths in Maine and Massachusetts during late autumn and winter. Cod are gregarious during the day, forming compact schools that swim between 30 and 80 m above the bottom, and scatter at night. To the south of its range, cod is found in shallow water only during the winter and there, as elsewhere, it is the younger smaller fish that live close inshore.

Although some groups of small cod are relatively stationary, individuals or groups may perform astonishingly long migrations. Some individuals migrate from native waters never to return, and movements of migrating individuals may be of the order of 5 km per day. A speed as high as 25.7 km/day for nearly a month has been calculated for a fish moving from east to west Greenland. Greenland cods have been observed to perform migrations over 1000 km, northeastern Atlantic cod, 800-900 km, while cod of the North Sea, the Channel, and the Irish Sea undertake migrations of lesser magnitude. In the Baltic, there is a tendency to migrate toward the Bornholm Basin (spawning and feeding ground). Arcto-Norwegian cod spends most of the year in the Barents Sea, but migrates seasonally to the Norwegian coast for spawning. In the western Atlantic, Gulf of Maine, cod may be driven out of the southernmost part of its range in summer and early autumn by increased water temperatures to waters of the polar current along the eastern coast of Labrador, which they leave again later in autumn to pass winter and spring either more southward or in deep waters.

Very little is known about the movements of young cod in their early years on the nursery grounds. There is a possibility that they undertake a seasonal migration to shallow water during the summer and return to deeper water in winter, although there is no evidence to support this. Movements seem to be restricted to feeding. The 3 and 4 year old immature cod move about in the Barents Sea when they follow the spawning capelin to the coast in March and April, and in the summer, they leave the coastal area and disperse, feeding on capelin and herring over the Barents Sea. When they are older, the young cod join the mature fish and make their first full spawning migration.

The earliest reported maturities for the Atlantic cod are at 2 years in its eastern (Oslofjord) and at 4 years in its western distribution. Although this fish has separate sexes, hermaphrodite specimens have been reported. The sex ratio is nearly 1:1, with a slight predominance of females. This is one of the world's most fecund fishes, with an average production of 1 million eggs per female. A 5 kg female produces approximately 2.5 million eggs; a 10 kg female 5 million and a 15 kg female, 7.5 million. The maximum production recorded is 9 millions eggs of a 34 kg fish. The eggs and the larvae up to 2.5 months are pelagic; subsequently the postlarvae settle to the bottom.

Although the spawning period varies among the North Atlantic subpopulations, most cod in the eastern and western parts of this ocean spawn from December to June, i.e., Norwegian coast, from February to April; Baltic Sea, April to July; North Sea, December to May; Gulf of Maine, November to April; Newfoundland, April to June; West Greenland, March to June; and southwestern Gulf of St. Lawrence, May to September. Usually the cod spawn at or near the bottom. There is some evidence that cod leave the bottom and school pelagically to spawn in preferred temperatures when bottom temperatures are unsuitable.

The maximum range of temperature for spawning is from below 0°C to about 12°C, with most spawning taking place over the lower half of this range. The Gulf of Maine stock spawns in colder waters than the other stocks. The distribution of spawning stocks widely depends on the oxygen content of the bottom water but on the whole, cod are rather local in their choice of spawning grounds in the Gulf of Maine as well as in Norwegian waters.

The major spawning area in the eastern Atlantic is the North Sea, generally at depths of less than 50 m and never beyond 200 m, especially in the Bornholm basin (Denmark) where the egg density appears to be rather high (late April, end of May). The most productive spawning ground in the western Atlantic is the eastern half of Georges Bank and the area south of the Grand Banks (Newfoundland). The second largest ground is the southwestern part of the Gulf of Maine, between Nantucket Shoals and Bay of Fundy. The Atlantic cod spawns once a year.

The growth rate is rather high, the females growing slightly faster than the males. It also varies from one area to another: for example, it is known that fish from the English Channel and the North Sea grow faster than those living at higher latitudes. Three-year-old fish average 56 cm (males) and 59 cm (females); 5-year olds, 81 cm (males) and 85 cm (females). The species lives up to 20 years.

The Atlantic cod is a voracious and omnivorous species. Larvae and postlarvae feed on plankton, juveniles mainly on invertebrates, and older fish on invertebrates and fish, including young cod. Small crustaceans are of oustanding importance (90%) in the food of juveniles (up to 25 cm length). They are progressively replaced by decapods of medium and large size. Fish become more important than crustaceans in the diet of older individuals. Other systematic groups play a smaller role as forage organisms: polychaetes (less than 10%); echinoderms and other benthic organisms (minor quantities); and occasionally seaweeds (Irish moss - ***Chondrus crispus***) and others. While the proportion of benthic organisms shows hardly any change throughout the year, fish consumption varies seasonally. Deep-water cod show preference for herring throughout the summer and autumn (peak June-July), but in winter and during the spawning period, they sustain themselves on mixed food in coastal areas. Feeding occurs at dawn and dusk, but small fish (of less than 20 cm) feed continuously.

Size : The various races reach different sizes, the oceanic cod often reaches 1 m and is known to attain a length of 2 m. Local races have smaller fish.

Interest to Fisheries : Among the most important of all commercial fishes, cod has been called "beef of the sea". The Atlantic cod has been exploited ever since man began to fish in the seas of Europe. Its value as a prime food-fish is enormous, and when salted and dried, it keeps for winter-time use or export.

This species accounts for nearly 30% of the world's total groundfish catch. Although landings in 1983 reached their lowest level in the eastern Atlantic, the stock is recovering and catches are again increasing.

The world catch reported for 1987 in the FAO Yearbook of Fishery Statistics totalled 2 054 721 metric tons. Of this total, 1 471 933 metric tons were taken in the northeastern Atlantic (Fishing Area 27), mainly by Iceland (ca 390 000 t), Norway (ca. 300 000 t), USSR (ca. 244 000 t), Denmark (ca. 150 000 t), UK (ca. 112 000 t) and others; and 582 788 metric tons in the northwestern Atlantic (Fishing Area 21), mainly by Canada (ca. 455 000 t), Spain (ca. 31 000 t), France (ca. 30 000 t) , USA (ca. 27 000 t) , Portugal (ca. 20 530 t) and others.

The Atlantic cod is caught mainly with bottom otter trawls and pelagic trawls. Devices such as handlines and cod traps are being recently replaced by gillnets (especially in Newfoundland). Other types of gear used are longlines, Danish seines, purse seines, twin beam trawls, light trawls, shrimp trawls and pound nets.

The Atlantic cod is fished throughout the year in the Gulf of Maine, large catches are made on rock and pebble grounds but also on soft bottoms. The major fishing grounds are boreo-arctic, mostly around Iceland, in the Barents Sea, off Newfoundland and West Greenland, in the Norwegian Sea, off Spitzbergen, and around Bear Island.

It is marketed fresh, chilled or frozen as fillets or whole, salted or sugar-salted, dried and salted, dried and unsalted, in brine, or smoked. Other products obtained from cod are salted cheeks, liver oil and eggs (smoked or as frozen roes).

Local Names : CANADA: Cod; DENMARK : Torsk; FRANCE: Morue; GERMANY: Dorsch, Kabeljau; NETHERLANDS: Kabel-jauw; NORWAY : Skrei, Torsk; SCANDINAVIA: Torsk; UK, USA: Cod; USSR: Treska.

Literature : Svetovidov (1948); Bigelow & Schroeder (1953); Andriashev (1954); Wise (1961, 1963); Harden Jones (1968).

Remarks : ***G. morhua*** includes a number of races that are characterized by size, colour, swimbladder morphology, temperature and/or salinity preferences, migratory behaviour and geographical distribution. Taxonomically named populations include ***G. morhua callarias,*** a low salinity, non-migratory race restricted to parts of the Baltic, ***G. morhua kildinensis***, restricted to a small lake on an island near the entrance to Kola Bay, and ***G. morhua morhua*** natio ***hiemalis,*** a race that migrates in and out Kandalaksha Bay.

Gadus ogac Richardson, 1836

Fig. 89

GADI Gadu 3

Scientific Name with Reference : ***Gadus ogac*** Richardson, 1836, Fauna Boreal.Americana, 3:246.

Synonyms : ***Gadus ovak*** Reinhardt, 1838; ***Gadus ogat*** Kröyer, 1847; ***Gadus callarius maris-albi*** Derjugin, 1920; ***Gadus morhua maris-albi*** Berg, 1933; ***Gadus morhua ogac,*** Svetovidov, 1948.

FAO Names : **En** - Greenland cod; **Fr** - Morue ogac; **Sp** - Bacalao de Groenlandia.

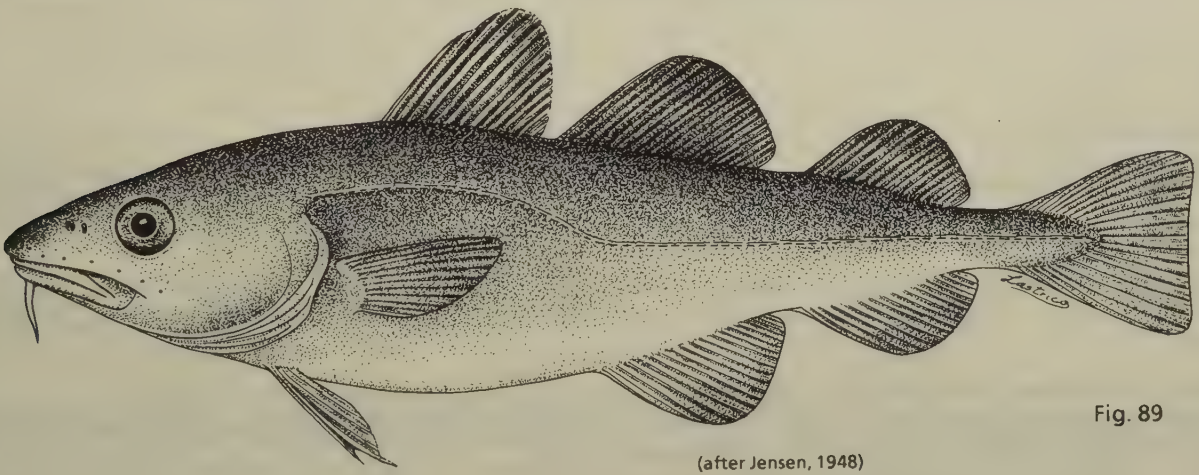


Fig. 89

(after Jensen, 1948)

Diagnostic Features : Head relatively broad, interorbital space 18-25% of head length; Predorsal distance less than about 33% of length. **Colour:** generally dark shading to paler ventrally, indistinct spots dorsally and on sides. Peritoneum dark.

Geographical Distribution : Port Barrow, Alaska to West Greenland; south along Canadian coast to the Miramichi, Gulf of St. Lawrence and Cape Breton Island; a disjunct population in the White Sea (Fig. 90).

Habitat and Biology : Usually lives close to the coast, from 0 to 200 m depth, and is rarely found offshore, in deeper water. It tolerates low salinities, but there is no evidence that it enters fresh-waters. It matures at 3 to 4 years of age and spawns in shallow waters from February to May. The eggs sink to the bottom after spawning. Fish aged 5 to 6 years attain lengths of about 50 cm; seldom lives beyond 9 years and rarely exceeds 60 cm total length. In Greenland waters, the maximum age is about 11 years. The food of the Greenland cod is very similar to that of the Atlantic cod, and includes capelin, small flounders, polar cod, shrimps, crabs, euphausiids, squids, polychaetes, and echinoderms.

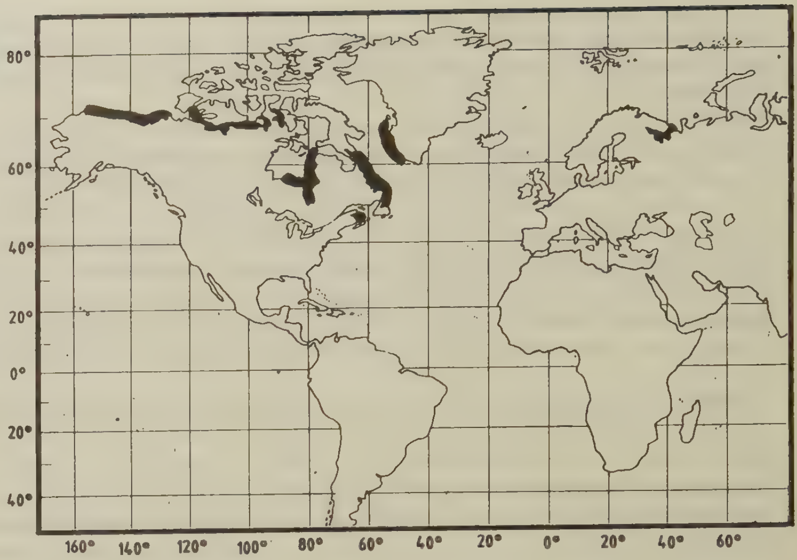


Fig. 90

Size : Reaches about 70 cm; somewhat smaller in the White Sea.

Interest to Fisheries : Presently only of small, local importance. The catch reported for 1987 in the FAO Yearbook of Fisheries Statistics is 4 017 metric tons. It used to be rather abundant in coastal waters of Greenland, but the stock has been strongly reduced in recent years. There is probably competition between this species and the Atlantic cod.

Local Names : CANADA: Greenland cod, Ogac; GERMANY : Fjord-dorsch, Grönland-dorsch.

Literature : Svetovidov (1948); Andriashev (1954); Backus (1957); Leim & Scott (1966).

Remarks : According to Svetovidov (1948), ***ogac*** is similar to ***Gadus marisalbi*** and Walters (1955) believes they are the same species. Although ***ogac*** and Atlantic cod (***G. morhua***) have different habitat preferences, they are sometimes found together and are able to maintain their separate identities.

Gaidropsarus

GADI Gaidr

Genus with Reference : ***Gaidropsarus*** Rafinesque, 1810, Indice Ittiol.Sicil.:11,51

Diagnostic Features : Barbel present on chin, and one barbel at each anterior nostril on the snout. First dorsal ray followed by a row of small, fleshy filaments; anal fin one, not indented. Lateral line interrupted along its entire length.

Habitat, Distribution and Biology as applicable : Bottom-living fishes found from the intertidal to the deep sea, mostly around the rim of the North Atlantic but recorded also from Japan, New Zealand, Kerguelen and South Africa. Larvae and juveniles known so far are silvery-sided pelagic fishes.

Interest to Fisheries : A few species are of small to minor interest, and appear as bycatch in trawl and longline fisheries.

Remarks : Additional taxonomic study is required to evaluate the minor differences between many of the described species, which have at one time or another been included in at least half a dozen nominal genera; hence, a key and a complete list of species are not feasible at present. Thirteen names are listed below on the basis of Svetovidov (1986), and accounts are presented for the 4 species known to be occasionally landed by fishing boats.

Tentative List of Species :

Gaidropsarus argentatus (Reinhardt, 1837) - North Atlantic, deep sea
Gaidropsarus biscayensis (Collett, 1890) - Northeast Atlantic including Mediterranean
Gaidropsarus capensis (Kaup, 1858) - South Africa
Gaidropsarus ensis (Reinhardt, 1837) - Northwest Atlantic, deep sea
Gaidropsarus granti (Regan, 1903) - Canary and Azore Islands
Gaidropsarus guttatus (Collett, 1890) - Madeira and Azore Islands
Gaidropsarus insularum Silvertsen, 1945 - South Africa, Tristan da Cunha, St. Paul, Amsterdam, and Gough Islands
Gaidropsarus macropthtalmus (Günther, 1867) - Northeast Atlantic
Gaidropsarus mediterraneus (Linnaeus, 1758) - Northeast Atlantic including Mediterranean
Gaidropsarus novaezelandiae (Hector, 1873) - New Zealand, Tasmania
Gaidropsarus pacificus (Temminck & Schlegel, 1842) - Japan
Gaidropsarus parini Svetovidov, 1986 - Southeast Pacific and possibly South Atlantic
Gaidropsarus vulgaris (Yarrell, 1836) - Northeast Atlantic including Mediterranean.

Gaidropsarus biscayensis (Collett, 1890)

Fig. 91

GADI Gaidr 3

Scientific Name with Reference : ***Onus biscayensis*** Collett, 1890, Bull.Soc.Zool.France, 15:107

Synonyms : ***Motella megalokynodon*** Kolombatovic, 1894:32; ***Gaidropsarus barbatus*** de Buen, 1934:502; ***Antonogadus megalokynodon***, Wheeler in Svetovidov, 1973.

FAO Names : **En** - Mediterranean bigeye rockling; **Fr** - Motelle; **Sp** - Barbada.

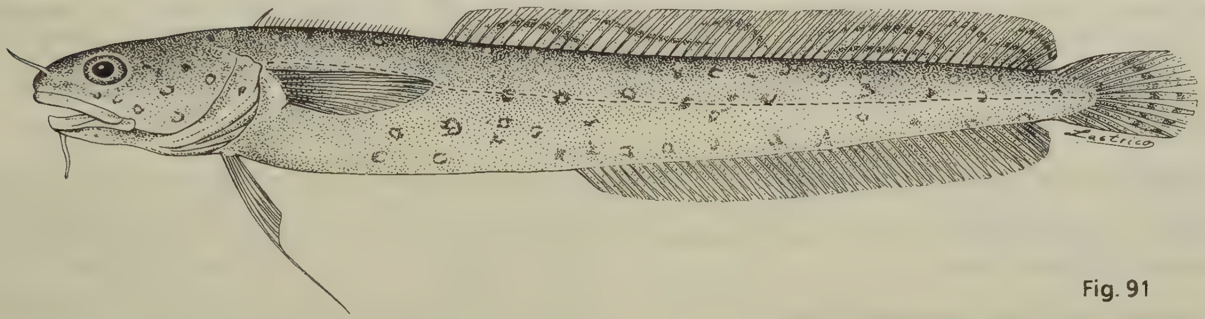


Fig. 91

Diagnostic Features : Two fang-like teeth at symphysis of upper jaw. First dorsal fin ray shorter than eye diameter; pectoral fin rays 17 to 19. **Colour:** brownish with dark brown sports; sides reddish, belly pink.

Geographical Distribution : Western Mediterranean and northern part of central Mediterranean; in the eastern central Atlantic, from Spain and Portugal to Morocco, and on Madeira Islands (Fig. 92).

Habitat and Biology : A demersal and bathypelagic species found in offshore waters on mud, shell and coral bottoms, at depths between 80 and 600 m. Spawning occurs in February. Feeds on crustaceans.

Size : Reaches exceptionally to about 40 cm total length; common size 8 to 15 cm.

Interest to Fisheries : Of minor importance, especially in view of its small size. No statistics are reported for this species. Taken as bycatch with bottom trawls; also on line gear. Occasionally present in markets in the Mediterranean.

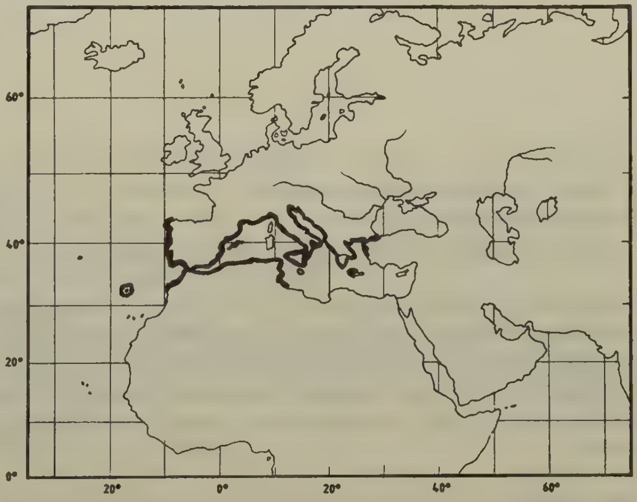


Fig. 92

Gaidropsarus macrophthalmus (Günther, 1867)

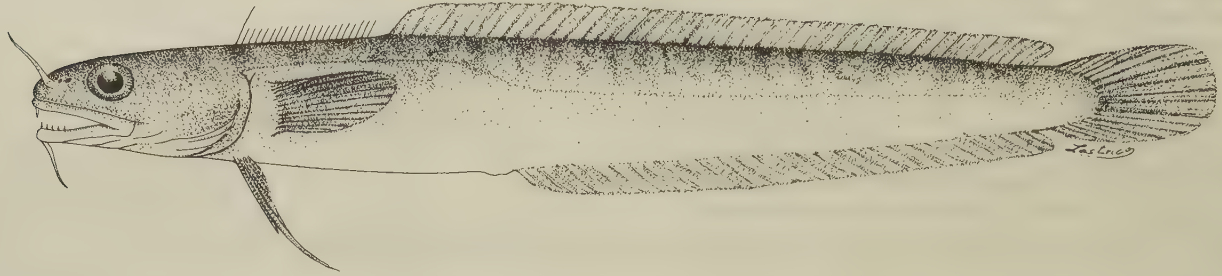
Fig. 93

GADI Gaidr 4

Scientific Name with Reference : ***Motella macrophthalmus*** Günther, 1867, Ann.Mag.nat.Hist., (3)20:290.

Synonyms : ***Onus macrophthalmus,*** Günther, 1887; ***Onus carpenteri*** Günther, 1887; ***Antonogadus macrophthalmus,*** Wheeler, 1969, 1978.

FAO Names : **En** - Bigeye rockling.



(after Bini, 1969)

Fig. 93

Diagnostic Features : Eye large, more than half the snout length. Several large canine teeth at front of upper jaw.

Geographical Distribution : Bay of Biscay and northwards along the west coast of the British Isles to the Faeroe Islands (Fig. 94).

Habitat and Biology : Benthic at depths from 150 to 530 m.

Size : Reaches possibly 25 cm total length.

Interest to Fisheries : Very minor; taken occasionally as bycatch in bottom trawls.

Literature : Bini (1969); Svetovidov (1986).

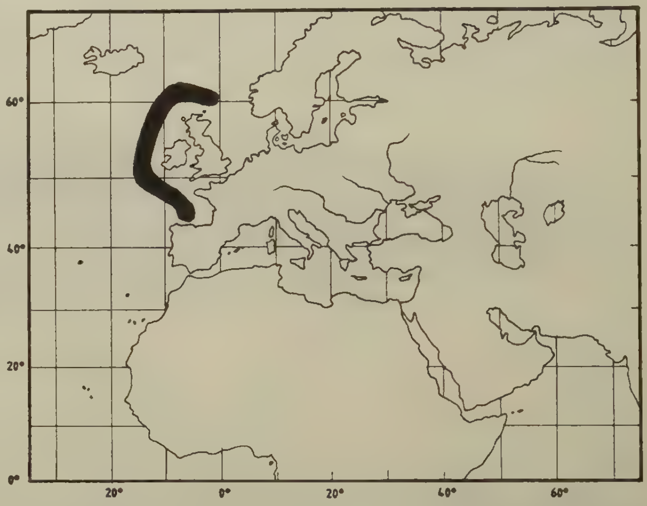


Fig. 94

Gaidropsarus mediterraneus (Linnaeus, 1758)

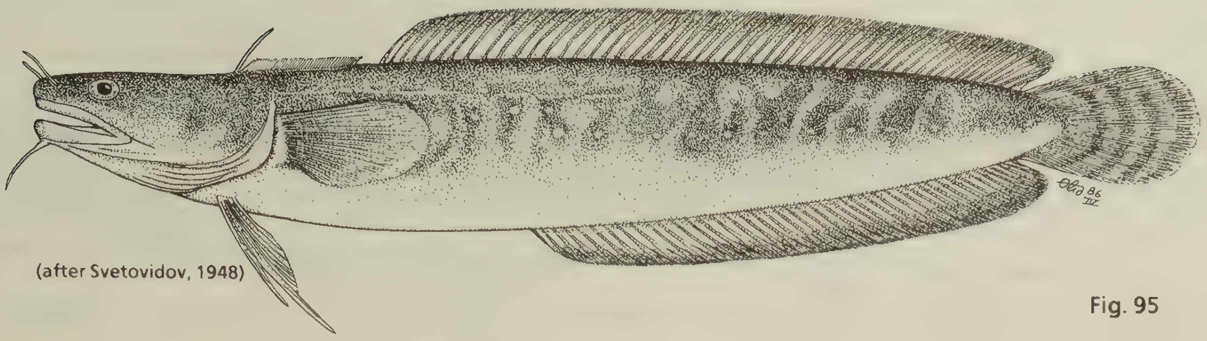
Fig. 95

GADI Gaidr 1

Scientific Name with Reference : ***Gadus mediterraneus*** Linnaeus, 1758 Syst.Nat., ed. 10:255.

Synonyms : ***Gadus tricirratus*** Brünnich,1768; ***Enchelyopus mediterraneus,*** Bloch & Schneider, 1801; ***Gaidropsarus mustellaris*** Rafinesque, 1810; ***Gadus fuscus*** Risso, 1810; ***Gadus jubatus*** Pallas, 1811; ***Gadus argenteolus*** Montagu, 1818; ***Onos mustella,*** Risso, 1826; ***Onos fusca,*** Risso, 1826; ***Mustela fusca,*** Cuvier, 1829; ***Merlangus communis*** Costa, 1844; ***Motella communis,*** Canestrini, 1863; ***Motella fusca,*** Moreau, 1881; ***Motella mediterranea,*** Lütken, 1882; ***Onos mediterraneus,*** Collett, 1892; ***Gaidropsarus mediterraneus,*** de Buen, 1934; ***Onos sellai*** Cipria, 1939.

FAO Names : **En** - Shore rockling; **Fr** - Motelle de Méditerranée; **Sp** - Bertorella.



(after Svetovidov, 1948)

Fig. 95

Diagnostic Features : First dorsal ray short, equal to or shorter than snout. Pectoral fin rays 15 to 18. No greatly enlarged teeth. **Colour:** variable; dorsally brown, sometimes reddish and with a vermiculated or mottled pattern. Paler ventrally, median fin borders dark.

Geographical Distribution : From southern Norway, around the western shores of the British Isles to the southwest and south coasts of Europe, into the Black Sea, and on the northwest African coast (Fig. 96).

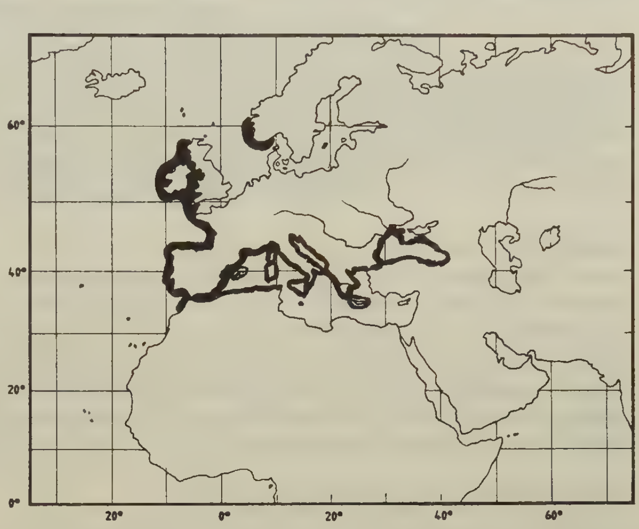


Fig. 96

Habitat and Biology : Lives generally at shallow depths near the shores on rocky bottom with aquatic vegetation to about 60 m depth. Also found at greater depths (200 to 450 m) on the north African coast. Spawns from September to March in the Mediterranean and Black Sea and from April to September in the northeastern Atlantic . Eggs and larvae are pelagic. It grows fast: at 1 year, 10 cm; at 3 years, 20 cm; at 6 years, 30 cm. Feeds on fish, crustaceans, worms and algae.

Size : Reaches to 50 cm total length.

Interest to Fisheries : No statistics are reported for this species. Taken as bycatch in small-scale and artisanal fisheries using trawls, gill nets, longlines, traps and handlines. Marketed fresh, but mostly as fish meal.

Local Names : ALBANIA: Motele me mustaqe; BULGARIA: Galja; FRANCE: Motelle à trois barbillons; GREECE: Gaidouropsaro; ITALY: Motella mediterranea; PORTUGAL : Laibeque; ROMANIA: Galea; SPAIN: Bertorella; TURKEY: Gelincik; UK: Shore rockling; USSR: Morskoy nalim, Sredizemnomorskiy trekhusiy nalim.

Literature : Svetovidov (1948, 1986) [Black Sea Fishes]; Bini (1969); Fischer, Bauchot & Schneider (1987)

Gaidropsarus vulgaris (Cloquet, 1824)

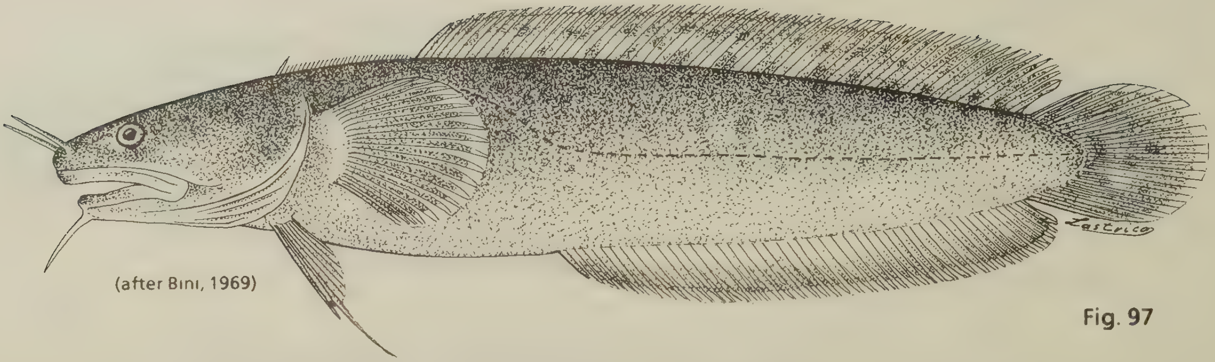
Fig. 97

GADI Gaidr 2

Scientific Name with Reference : ***Mustela vulgaris*** Cloquet, 1824, Dict.Sci.Nat., 33:456

Synonyms : ***Gadus tricirratus*** Bloch ,1785; ?***Onos maculata*** Risso, 1826:214; ***Motella tricirrata,*** Nilsson, 1832; ***Motella vulgaris***, Yarrell, 1836; ***Onos vulgaris,*** Collett, 1890; ***Onos tricirratus,*** Smitt, 1893; ***Gaidropsarus tricirratus,*** de Buen, 1934; ***Gaidropsarus vulgaris,*** Svetovidov, 1948.

FAO Names : **En** - Three-bearded rockling; **Fr** - Motelle commune; **Sp** - Lota.



(after Bini, 1969)

Fig. 97

Diagnostic Features : No large canine teeth at front of upper jaw. First dorsal ray short, equal to or not much longer than eye diameter; pectoral-fin rays 20 to 22. **Colour :** pale cream to pink or reddish with brown blotches, mainly on the dorsal half of head and body and extending onto the dorsal fin.

Geographical Distribution : From the central Norwegian coast and the Faeroe Islands southwards through the North Sea and around the British Isles to the region around the Straits of Gibraltar, and the western and northern coasts of the Mediterranean (Fig. 98).

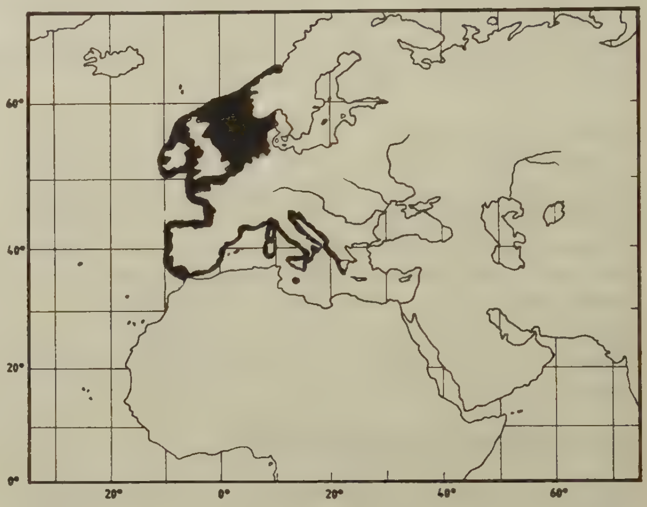


Fig. 98

Habitat and Biology : Benthic at depths from 10 to 120 m on rocky bottoms but also on mud, sand and gravel. Spawns from May to August in western Ireland, in spring and summer in the Mediterranean. Eggs and larvae are pelagic. Growth is rapid: at 1 year, 18 cm, at 2 years, 23 cm; at 3 years, 27 cm, at 4 years, 31 cm, at 5 years, 34 cm, and at 6 years, 36 cm. Feeds on shrimps, crabs, isopods, small fish, molluscs and polychaetes.

Size : Reaches about 60 cm total length.

Interest to Fisheries : A common species, often taken by trawls, bottom longlines and hand lines. Occasionally found on markets, usually fresh. The flesh is difficult to preserve.

Local Names : BULGARIA: Galja; DENMARK: Tredadet havkvabbe; FRANCE: Motelle commune; GREECE: Agoullanós; ITALY: Motella maculata; MALTA: Ballotra; SPAIN: Lota; UK: Three-bearded rockling; YUGOSLAVIA: Ugorova majka pecatica.

Literature : Bini (1969); Wheeler (1969); Svetovidov (1986); Fischer, Bauchot & Schneider, eds (1987).

Lota

GADI Lota

Genus with Reference : ***Lota*** Cuvier in Oken, 1817, Isis: 1182.

Diagnostic Features : See species.

Remarks : Treated as three subspecies by Svetovidov (1948) and others; however, Scott & Crossman (1973) do not agree and recognize only a single form.

Lota lota (Linnaeus, 1758)

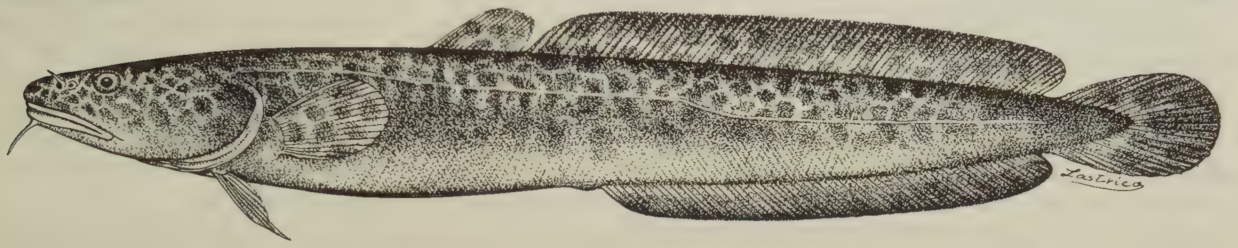
Fig. 99

GADI Lota 1

Scientific Name with Reference : ***Gadus lota*** Linnaeus, 1758, Syst.Nat., ed.X:255.

Synonyms : ***Enchelyopus lota,*** Bloch & Schneider, 1801; ***Gadus lacustris*** Walbaum, 1792; ***Gadus maculosa*** Le Sueur, 1817; ***Gadus compressus*** Le Sueur, 1817; ***Molva maculosa*** Le Sueur, 1819; ***Molva lota,*** Fleming, 1828; ***Lota brosmina*** Storer, 1839; ***Lota maculosa,*** De Kay, 1842; ***Lota compressa,*** De Kay, 1842; ***Lota inornata*** de Kay, 1842; ***Lota vulgaris*** Kessler, 1864; ***Lota linnei*** Malm, 1877; ***Lota vulgaris obensis*** Anikin, 1902; ***Lota lota kamensis*** Markun, 1936; ***Lota lota lota,*** Hubbs & Schultz, 1941; ***Lota lota leptura*** Hubbs & Schultz, 1941; ***Lota lota maculosa,*** Hubbs & Schultz, 1941.

FAO Names : **En** - Burbot; **Fr** - Lotte de rivière; **Sp** - Lota de río



(adapted from Svetovidov, 1948 and from Scott & Crossman, 1973) Fig. 99

Diagnostic Features : Anterior nostril with a prominent barbel-like flap. Teeth all small and brush-like. Dorsal fins two; anal fin one; none connected with caudal fin; first dorsal ray followed by similar rays, 9 to 16 rays in total; pelvic fin with a slightly elongate ray, falling short of end of pectoral fin. Lateral line continuous to about end of dorsal- and anal-fin bases, interrupted to end of body. **Colour :** yellow, light tan to brown overlaid by a pattern of darker brown or black.

Geographical Distribution : Circumarctic in freshwater, in some areas as far south as 40° (Fig. 100).

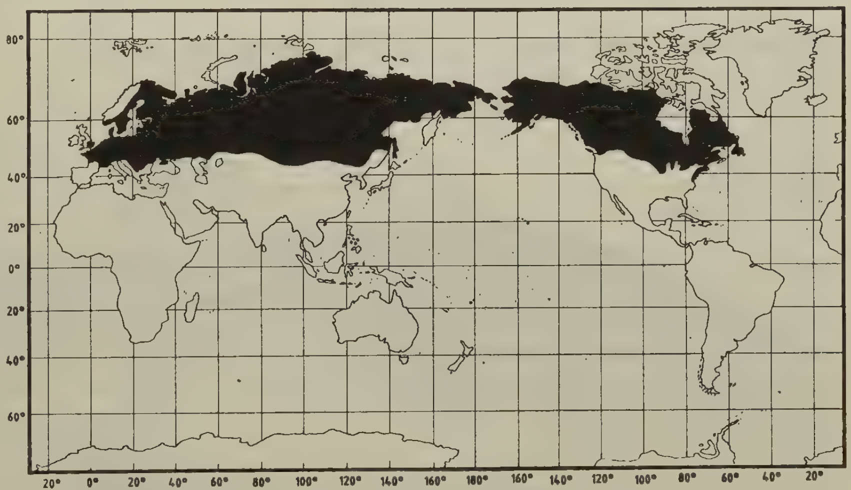


Fig. 100

Habitat and Biology : Found on the bottom of lakes and rivers at depths that vary seasonally from ca. 0.5 to 230 m. The burbot spawns from November to May, considering its whole area of distribution, but mainly from January to March in Canada, and in December in the Anadyr River (USSR). Spawning takes place at night, usually under the ice in shallow waters (ca. 0.5 to 3 m depth) at surface temperatures ranging from 0.6° to -1.7°C, over sand or gravel. The eggs are semipelagic. Fecundity estimates in Canada range from 45 600 eggs in a 34 cm female to 1 362 077 eggs in a 64 cm female. Growth in the first 4 years is rapid, but decreases thereafter. The young attain lengths of 7.6 to 21 cm by the end of the first year; in Lake Simcoe, Ontario, burbot at age 5 average about 55 cm total length. The maximum life expectancy is probably 15 years. The burbot is a voracious predator and night feeder. Small burbot feed on insect larvae, crayfish, molluscs and other invertebrates, but relatively few fishes, while individuals over 50 cm total length feed almost exclusively on fishes. It is an important competitor for food of lake trout and white fishes.

Size : May reach 120 cm or more in total length; common size to about 40 cm.

Interest to Fisheries : Fished commercially in Finland, Sweden and the European part of USSR, while it is of minor commercial importance in Alaska and Canada. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics totalled 1 577 metric tons (Finland: 1 540 t; Sweden 37 t). Marketed mainly salted or used as pet food.

Local Names : CANADA: American burbot, Burbot, Eelpout, Freshwater eel, Lawyer, Ling, Maria, Methy; USA: Burbot, Lush (Alaska).

Literature : Svetovidov (1948); Scott & Crossman (1973).

Melanogrammus

GADI Mela

Genus with Reference : ***Melanogrammus*** Gill, 1862 (1863), Proc.Acad.Nat.Sci.,Philad.: 280.

Diagnostic Features : See species.

Remarks : A single species in the genus.

Melanogrammus aeglefinus (Linnaeus, 1758)

Fig. 101

GADI Mela 1

Scientific Name with Reference : ***Gadus aeglefinus*** Linnaeus, 1758, Syst.Nat., ed.X:251.

Synonyms : ***Morhua aeglefinus,*** Fleming, 1828; ***Aeglefinus linnei*** Malm, 1877.

FAO Names : **En** - Haddock; **Fr** - Eglefin; **Sp** - Eglefino.

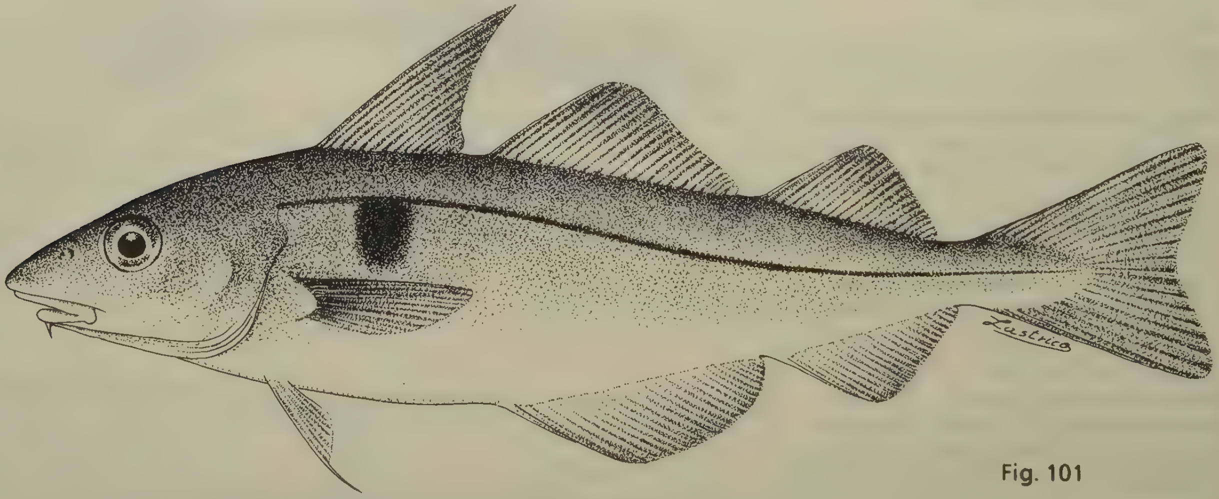


Fig. 101

(adapted from Bigelow & Schroeder, 1953 and from Quéro, 1984)

Diagnostic Features : Palatine teeth lacking. Chin barbel rather small. Lower jaw shorter than upper. Three dorsal fins, two anal fins, all separate from each other; first anal fin base short, less than one-half of preanal distance. Lateral line dark, uninterrupted to the end of body, or nearly so. Lateral-line pores present on head. Scales overlapping. **Colour:** large dark blotch above pectoral fin.

Geographical Distribution : In the eastern North Atlantic from the Bay of Biscay to Spitzbergen; in the Barents Sea to Novaya Zemlya; around Iceland; rare at the southern Greenland. In the western North Atlantic from Cape May, New Jersey to the Strait of Belle Isle (Fig. 102).

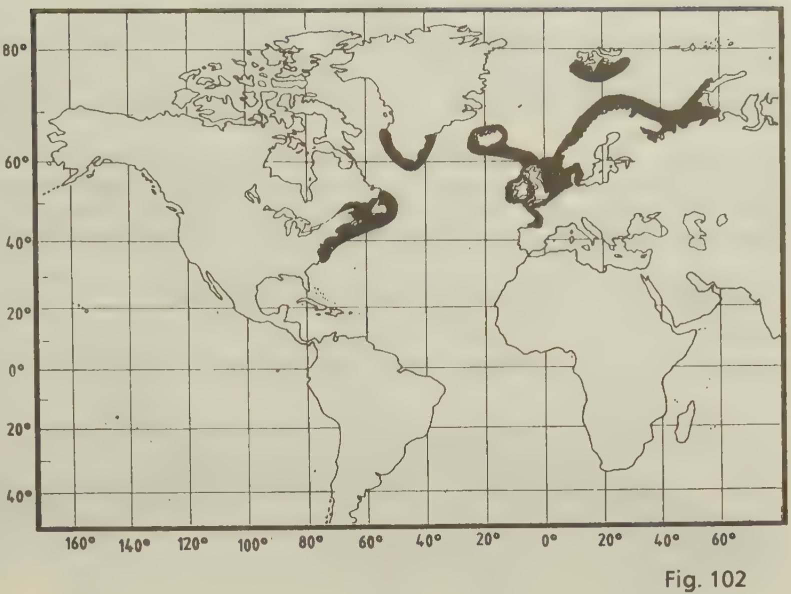


Fig. 102

Habitat and Biology : A demersal species found from 10 to 450 m depth, more common from 80 to 200 m, over rock, sand, gravel or shells, usually at temperatures between 4° and 10°C. Haddock undertake extensive migrations in the Barents Sea and Iceland, and more restricted movements in the northwestern Atlantic, mostly to and from the spawning grounds. First maturity is reached at 4 years for males and 5 years for females, except in the North Sea stock where is is reached at 2 and 3 years respectively. Although the overall sex ratio is about 1:1, females predominate in shallow waters and males on offshore grounds. Fecundity ranges from 55 000 eggs for a 25 cm fish to 1 841 000 eggs for a 91 cm specimen. Spawning occurs in typically marine waters (35‰ salinity) between ca. 50 to 150 m depth, in the northwestern Atlantic from January to July (depending on the areas) and in the northeastern Atlantic from February to June (mostly in March-April). The eggs are pelagic and the larvae are believed to be pelagic for some 3 months. The growth rate varies considerably with regions, the length of the fish ranging from 17 to 19 cm at the end of the first year from 25 to 36 cm at 2 years, from 37 to 58 cm at 5 years, from 71 to 76 cm at 10 years, and from 75 to 82 at 13 years. Life expectancy is about 14 years.

The haddock is an omnivorous fish, feeding mainly on relatively small bottom-living organisms including crustaceans, molluscs, echinoderms, worms and fishes.

Size : Rarely exceeding 1 m total length.

Interest to Fisheries : An important target species in North Atlantic fisheries. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics totalled 398 522 metric tons. Most of this catch (363 353 metric tons) was taken in the northeastern Atlantic (UK: ca. 119 000 t, USSR: ca. 78 000 t, Norway: ca. 75 000 t, Iceland, ca. 39 000 t, Faeroe Islands: ca. 17 000 t, France: ca. 12 000 t, Denmark: ca. 11 000 t, and others), and 35 169 metric tons in the northwestern Atlantic (Canada: ca. 29 000 t, USA: ca. 3 000 t, France: ca. 2 000 t, Spain: ca. 1 100 t, and others). The major fishing grounds are located off the European coasts of USSR, around Iceland, in the Barents Sea, around the Faeroe Islands, off western Norway and western Scotland, in the Celtic Sea, off Ireland, in the North Sea and in the English Channel.

The haddock is fished with bottom trawls, longlines, gillnets and traps. It is marketed fresh, chilled as fillets, frozen, smoked and canned; also processed to fish-meal and used for animal feeds.

Local Names : DENMARK: Kuller, Schellfisch; FRANCE : Ane, Anon, Bourricot, Calever, Eglefin, Habillot, Saint-pierre; FINLAND : Kolja; GERMANY : Schellfisch; ICELAND : Ysa; ITALY : Asinello; NETHERLANDS: Schelviskkuller; NORWAY: Hyse; POLAND : Lupacz, Plamcak; PORTUGAL : Bacalhau; SPAIN: Eglefino; SWEDEN : Kolja, Kalja; UK : Haddock; USSR : Piksha.

Literature : Svetovidov (1948); Bigelow & Schroeder (1953); Leim & Scott (1966); Blacker (1971).

Merlangius

GADI Merla

Genus with Reference : ***Merlangius*** E.L. Geoffroy, 1767, Descriptions, vertus et usages, etc.: 401.

Diagnostic Features : See species.

Remarks: A single species divided into two subspecies by most authors.

Merlangius merlangus (Linnaeus, 1758)

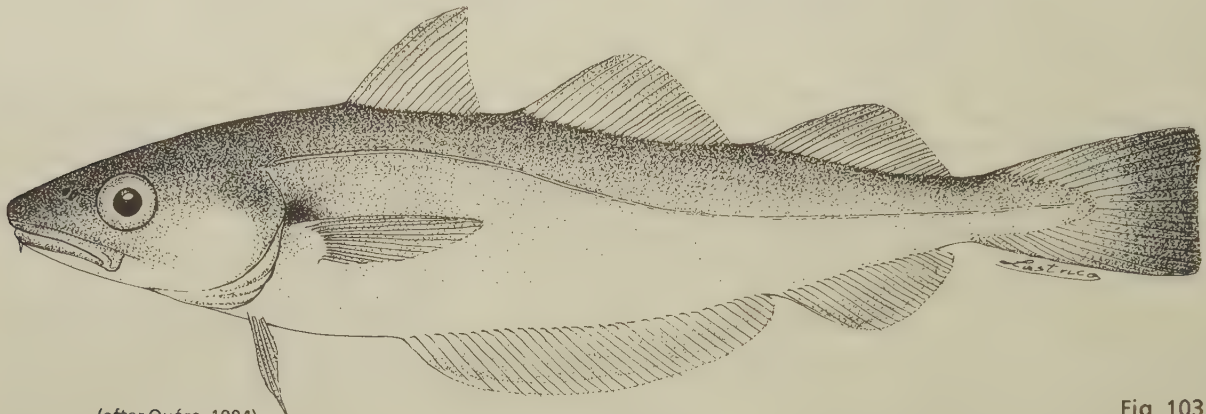
Fig. 103

GADI Merla 1

Scientific Name with Reference : ***Gadus merlangus*** Linnaeus, 1758, Syst.Nat., ed.X:253.

Synonyms : ***Merlangus vulgaris*** Fleming, 1828; ***Gadus euxinus*** Nordmann, 1840; ***Merlangus linnei*** Malm, 1877; ***Gadus merlangus merlangus,*** Svetovidov, 1935; ***Gadus merlangus euxinus,*** Svetovidov, 1935; ***Odontogadus merlangus merlangus,*** Svetovidov, 1948; ***Odontogadus merlangus euxinus,*** Svetovidov, 1948; ***Merlangius merlangus merlangus,*** Bini, 1970; ***Merlangius merlangus euxinus,*** Bini, 1970.

FAO Names : En - Whiting; **Fr** - Merlan; **Sp** - Plegonero.



(after Quéro, 1984)

Fig. 103

Diagnostic Features : Chin barbel absent or small. Upper jaw projecting slightly. Three dorsal fins separated by small spaces and two anal fins touching each other or nearly so; anterior anal fin base elongate, one-half or more of preanal distance; pectoral fin reaching well beyond origin of anal fin; pelvic fin with a slightly elongated ray. Lateral line continuous along its entire length. Lateral-line canals on head with pores. **Colour:** variable; often a small dark blotch at upper base of pectoral fin.

Geographical Distribution : Eastern North Atlantic from the southeastern Barents Sea and Iceland to Portugal, also in the Black Sea, Aegean Sea, Adriatic Sea and adjacent areas. Rare in the northwestern Mediterranean according to Bini, 1970 (Fig. 104).

Habitat and Biology : Benthopelagic at depths from 10 to 200 m, but more common from 30 to 100 m, mainly on mud and gravel bottoms, but also on sand and rock. The young are found in shallower waters, from 5 to 30 m depth. Whitings migrate only after the first year of life when they leave the nursery areas for the open sea. First maturity is attained at 3 or 4 years of age. The sex ratio averages 38.5% males and 61.5% females in the Irish Sea, and 32.2% and 67.8% respectively in the North Sea. Fecundity estimates range from 200 000 eggs in small females to over 1 million eggs in large individuals. Spawning occurs at 20 to 150 m depth, from January to September in the area between the British Isles and the Bay of Biscay, from January to spring in the Mediterranean, and throughout the year in the Black Sea. The eggs are pelagic, and the larvae and juveniles are associated with jellyfish, and do not become demersal until they reach 5 to 10 cm length. Growth is rapid; at one year of age, the size of fish ranges from 15 to 19 cm, at 2 years, from 22 to 5 cm, at 3 years, from 30 to 34 cm; females grow faster than males, life expectancy is about 10 years. The diet of adults includes shrimps, crabs, molluscs, small fish, polychaetes and cephalopods.

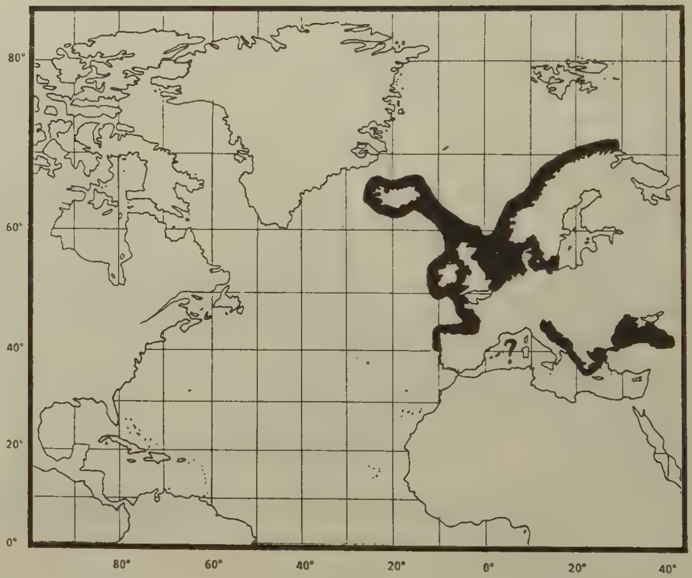


Fig. 104

Size : Rarely reaching 70 cm; more common less than 23.50 cm.

Interest to Fisheries : A relatively common fish taken especially in European Atlantic waters. The catch for 1987 reported in the FAO Yearbook of Fishery Statistics totalled 152 608 metric tons, of which 119 701 metric tons were taken in the northeastern Atlantic (UK: ca. 59 000 t, France: ca. 33 000 t, Ireland: ca. 9 600 t, Netherlands,: ca. 8 600 t, Denmark: ca. 3 000 t, and others) and 32 907 metric tons in the northwestern Atlantic (Turkey: 29 500 t, USSR: ca 2 800 t, and others).

Whiting are caught mostly by bottom trawls and longlines; also handlines and occasionally, purse seines are used. They are marketed fresh, as chilled fillets, frozen, and dried-salted. Also used as ~~feed for~~ the Black Sea-trout.

Local Names : ALGERIA: Murluts; BULGARIA: Medzid; DENMARK: Hvilling; FRANCE : Lécaud, Merlan, Merlana, Merlin, Merlu, Nasellu, Varlet (young); GERMANY : Wittling; GREECE: Taoúki; ISRAEL: Merlan; ITALY: Merlano, Molo; MAROC: Peskadil'ia MONACO: Merlan; NETHERLANDS: Wijting; POLAND: Witlinek; PORTUGAL : Badejo; ROMANIA: Bacaliar; SPAIN: Merlan, Plegonero; SWEDEN: Vitling; TUNISIA: Nazalli; TURKEY; Bakalyaro, Mezgit; USSR : Chernomorskiy merlang; UK: Whiting.

Literature : Svetovidov (1948); Nagabhushanam (1964); Garrod & Gambell (1965); Bini (1969); Fischer, Bauchot & Schneider, eds (1987).

Remarks : Whiting from the Black Sea and adjacent waters are treated as separate subspecies by most ichthyologists.

Microgadus

GADI Micro

Genus with Reference : ***Microgadus*** Gill, 1865, Proc.Acad.Nat.Sci.Philad., :69.

Diagnostic Features : Lower jaw shorter than upper. No palatine teeth. A short chin barbel present. Three dorsal and two anal fins, distinctly separate from each other; pectoral fin not reaching far beyond anal fin origin. Lateral line continuous to end of third dorsal fin, then interrupted to end of body. Lateral-line pores absent from head. Parapophyses not expanded at their tips.

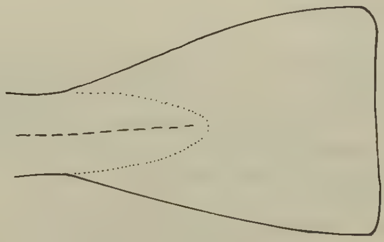
Habitat, Distribution and Biology : Benthopelagic, mostly inshore, found along north temperate to boreal coasts of northeast and northwest North America.

Interest to Fisheries : Of minor importance.

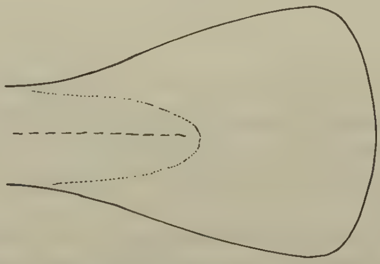
Key to species :

1a. Gill rakers on first arch 26 to 28. Caudal fin truncate (Fig. 105a) .... ***M. proximus***

1b. Gill rakers on first arch 16 to 21. Caudal fin rounded (Fig. 105b) .... ***M. tomcod***



a. *M. proximus*



b. *M. tomcod*

Caudal fin Fig. 105

Microgadus proximus (Girard, 1854)

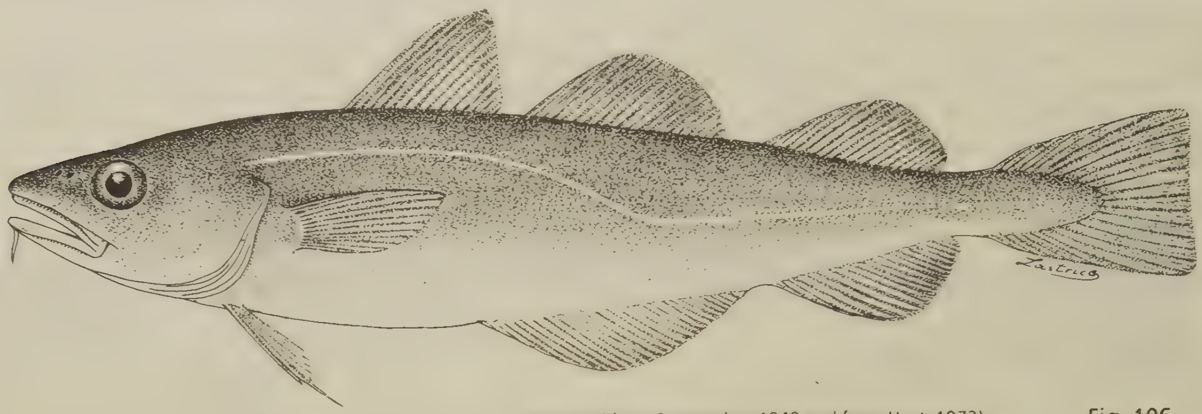
Fig. 106

GADI Micro 1

Scientific Name with Reference : ***Gadus proximus*** Girard, 1854, Proc.Acad.Nat.Sci.Philad., 1854:141

Synonyms : ***Morrhua californica*** Ayres, 1857; ***Morrhua proxima,*** Girard, 1858; ***Gadus californicus,*** Günther, 1862.

FAO Names : En - Pacific tomcod; **Fr** - Poulamon du Pacifique.



(adapted from Svetovidov, 1948 and from Hart, 1973)

Fig. 106

Diagnostic Features : Gill rakers on first arch 26 to 28. Caudal fin truncate. **Colour:** olive green dorsally, pale ventrally; fins dusky marginally.

Geographical Distribution : Southeastern Bering Sea to Central California (Fig. 107).

Habitat and Biology : A demersal species generally found in 25 to 120 m depth over sand, but it may occur to depths of 260 m; may enter brackish water. Feeds mostly on shrimps, amphipods, isopods, gastropods, mussels and fish. Subject to copepod parasitism (inside the mouth).

Size : Reaches 30 cm.

Interest to Fisheries : No catch statistics are reported for this species. Of limited value, since not very abundant, but highly esteemed. Used fresh, occasionally trawled or taken on hook and line, especially by recreational fishermen.

Local Names : CANADA, USA : Pacific tomcod.

Literature : Hart (1973).

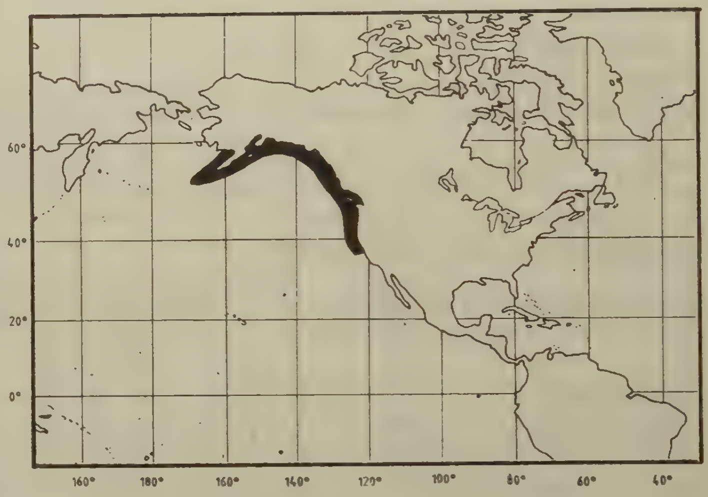


Fig. 107

Microgadus tomcod (Walbaum, 1792)

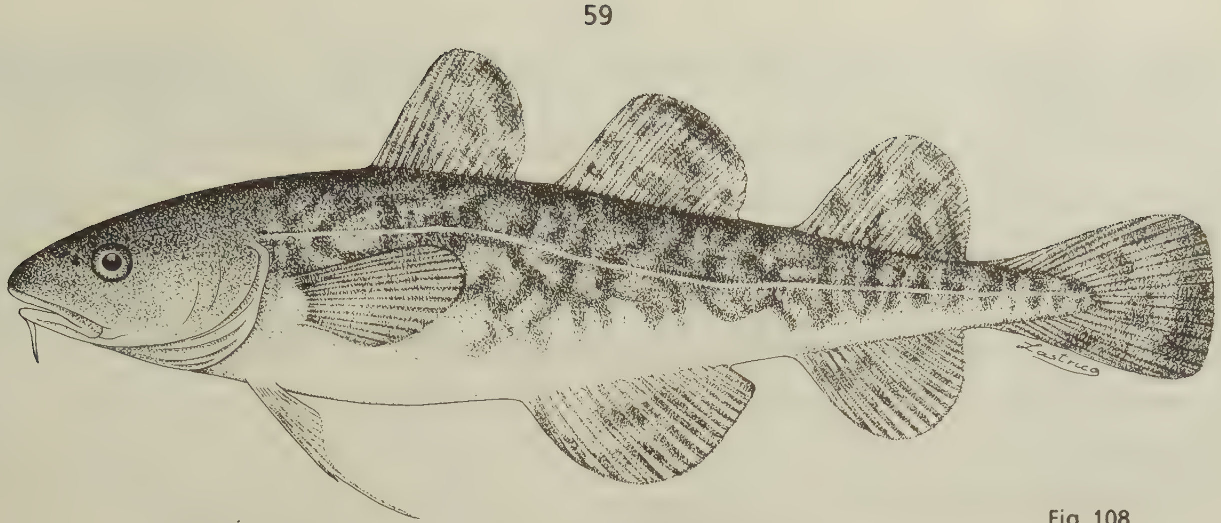
Fig. 108

GADI Micro 2

Scientific Name with Reference : ***Gadus tomcod*** Walbaum, 1792, In Artedi, Gen.Pisc.,:133.

Synonyms : ***Gadus frost*** Walbaum, 1792; ***Gadus pruinosus*** Mitchill, 1815; ***Gadus tomcod fuscus*** Mitchill, 1815; ***Gadus tomcod luteus*** Mitchill, 1815; ***Gadus tomcodus mixtus*** Mitchill, 1815; ***Gadus polymorphus*** Mitchill, 1815; ***Morrhua tomcodus,*** Storer, 1839; ***Morrhua pruinosa,*** Storer, 1858.

FAO Names : En - Atlantic tomcod; **Fr** - Poulamon de l'Atlantique.



(adapted from Bigelow & Schroeder, 1953 and from Scott & Crossman, 1973)

Fig. 108

Diagnostic Features : Gill rakers on first arch 16 to 21. Pelvic fin with a slightly elongated filament. Caudal fin rounded. **Colour:** dorsally olive brown to green or yellow, paler ventrally; dark mottling on sides and fins.

Geographical Distribution : Southern Labrador to Virginia (Fig. 109).

Habitat and Biology : Demersal in coastal, brackish and fresh water, landlocked in several lakes. No inshore-offshore migrations, but moves from shore into deeper cooler waters in spring, and returns in autumn and winter (November to February) to estuaries and freshwater streams to spawn. The eggs tolerate a wide range of salinity and can develop equally well in freshwater and in salinities up to one-half that of ordinary sea water. Feeds mostly on small crustaceans (especially shrimps and amphipods; also on worms, small molluscs, squids and fish fry.

Size : Reaches 36 cm total length, but rarely exceeds 30 cm.

Interest to Fisheries : A popular sports and food fish, though of limited abundance. Landings reported in the FAO Yearbook of Fishery Statistics were 304 metric tons in 1978, 255 t in 1986 and only 10 t in 1987 (all Canada). Taken with bag nets, pocket nets, and weirs. In the past, hook and line and traps were also used. The major fishing grounds are in Massachusetts and New England. Often taken incidental to smelt, but not plentiful enough to support a regular commercial fishery.

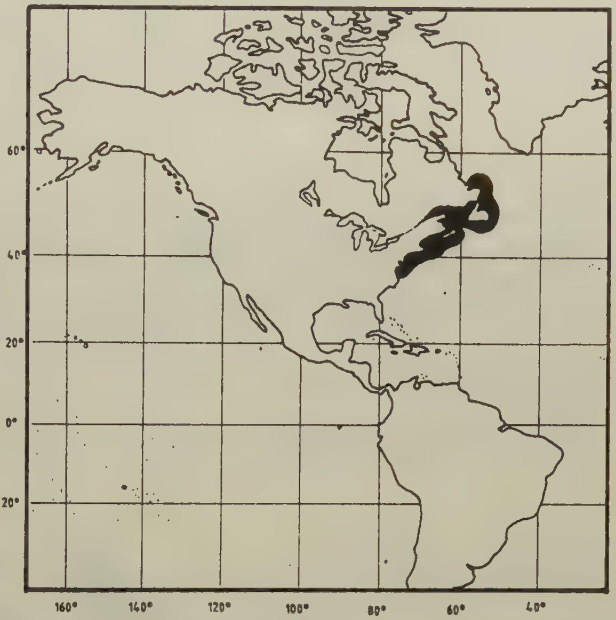


Fig. 109

Local Names : CANADA : Atlantic tomcod, Frostfish, Poulamon; USA : Atlantic tomcod, Frostfish.

Literature : Bigelow & Schroeder (1953); Scott & Crossman (1973).

Micromesistius

GADI Microm

Genus with Reference : ***Micromesistius*** Gill, 1826, Proc.Acad.Nat.Sci.Philad., :1863(1864);231-248.

Diagnostic Features : Lower jaw longer than upper; no barbel at tip of lower jaw. Three dorsal fins separated by long spaces and two anal fins, the anterior one long-based, extending from about beginning of first to beginning of third dorsal fin; pectoral fin reaching well beyond origin of anal fin; no elongated rays in pelvic fin. Lateral line continuous along entire length of body. Head with lateral-line pores.

Habitat, Distribution and Biology : Benthopelagic to pelagic in the southern Pacific and the southwestern Atlantic.

Interest to Fisheries : Important commercial fish.

Key to species :

1a. Gill rakers on first arch 38 to 48 ...... ***M. australis*** (Fig. 110)

1b. Gill rakers on first arch 26 to 34 .. ***M. poutassou*** (Fig. 112)

Micromesistius australis Norman, 1937

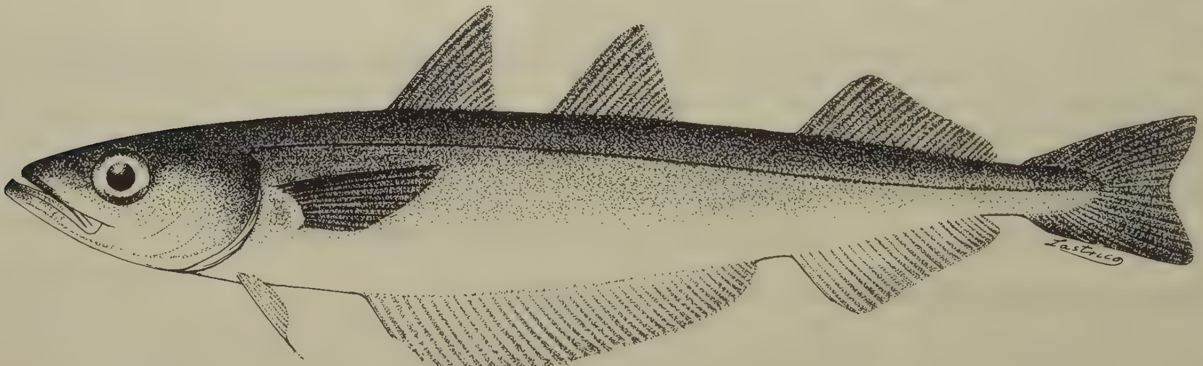
Fig. 110

GADI Microm 2

Scientific Name with Reference : ***Micromesistius australis*** Norman, 1937, Discovery Rept., 16:51.

Synonyms : ***Micromesistius australis australis,*** Inada & Nakamura, 1975; ***Micromesistius australis pallidus*** Inada & Nakamura, 1975.

FAO Names : En - Southern blue whiting; **Fr** - Merlan bleu austral; **Sp** - Polaca.



(adapted from Norman, 1937 and from Inada, in Nakamura (ed.) 1986)

Fig. 110

Diagnostic Features : Gill rakers on first arch 38 to 48.

Geographical Distribution : There are two disjunct populations, one of which (***M. a. australis***) is found from about 38°S to nearly 62°S around the Falkland/Malvinas Islands and Argentine Patagonia in the western South Atlantic; also off South Georgia, South Shetland and South Orkney Islands and in the southeastern Pacific, off Chile; the other population (***M. a. pallidus***) lives on the various banks and rises around the South Island of New Zealand (Fig. 111).

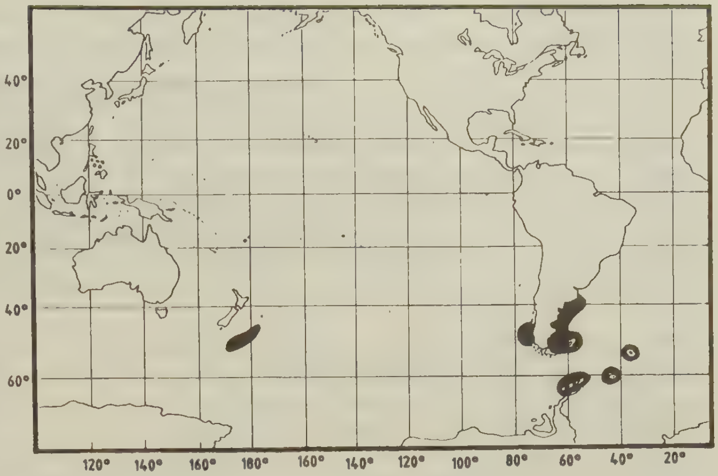


Fig. 111

Habitat and Biology : Benthopelagic to pelagic at depths of about 70 to 800 m, invading the shelf waters during summer and concentrating over the continental slope in winter. The New Zealand population is most abundant at 500 m (range: 180 to 800 m), the Argentine fishes at about 200 m (range: 70 to 620 m). In warm summers, the population of the Falkland/Malvinas current (on the Patagonian shelves of Argentina and southern Chile) migrates southward to S. Georgia, S. Shetland Islands, Elephant Island and the northern part of the Antarctic Peninsula. Up to 30 cm length, all fish are males, at 50 cm females and males are in the same proportion, and larger than 50 cm 90% are females. Spawning occurs from June to July in New Zealand and spring to early summer in Patagonia and the Falkland/Malvinas Islands. Growth rate differs by sex with females larger than males: 1 year = 13 cm; 2 years = 22 cm; 3 years = 29 cm; 10 years = 50 cm females and 47 cm males. The young feed on euphausids and amphipods and occasionally on copepods, cephalopods, octopods and small fish.

Size : Reaching 90 cm total length, common to 60 cm.

Interest to Fisheries : Caught with mid-water and bottom trawls, mostly on the Patagonia/Fuegan shelf, off Argentina by Polish, Russian and Bulgarian vessels, and off the southern shelf of New Zealand by Russian vessels. Landings reported for 1987 in the FAO Yearbook of Fishery Statistics amounted to 103 777 metric tons, of which 84 794 t were taken off Argentina, 16 410 t off New Zealand, and 2 573 t off Chile. Also very abundant around Elephant and S. Orkney Islands. Utilized mainly in frozen blocks and as fish meal.

Local Names : ARGENTINA: Polaca; CHILE: Merluza de tres aletas.

Literature : Lopez & Bellisio (1973); Inada & Nakamura (1975); Bellisio, Lopez & Tomo (1979), Inada (1986).

Micromesistius poutassou (Risso, 1826)

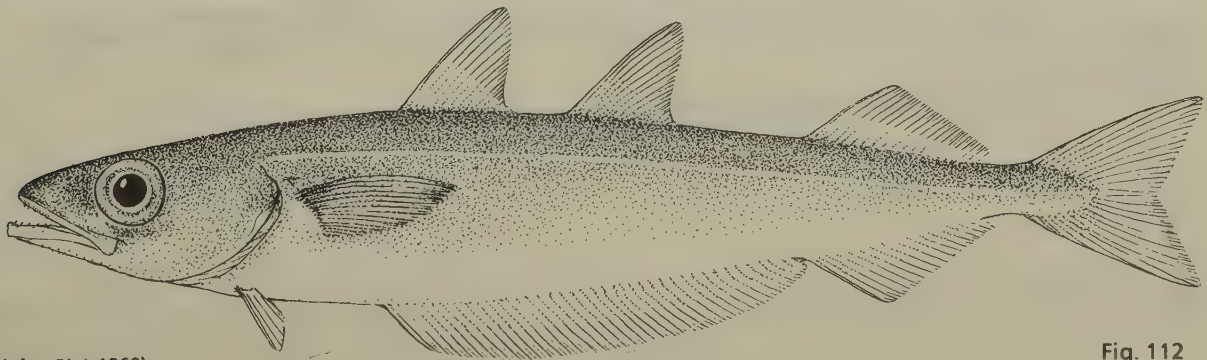
Fig. 112

GADI Microm 1

Scientific Name with Reference : ***Merlangus poutassou*** Risso, 1826, Hist.Nat.Eur.Merid., 2:277.

Synonyms : ***Merlangus vernalis*** Risso, 1826; ***Merlangus pertusis*** Cocco, 1829; ***Merlangus albus*** Yarrell, 1841; ***Merlangus communis*** Costa, 1844; ***Gadus potassoa*** Düben & Koren, 1846; ***Gadus melanostomus*** Nilsson, 1855; ***Boreogadus poutassou,*** Malm, 1877; ***Gadus poutassou,*** Moreau, 1881.

FAO Names : **En** - Blue whiting; **Fr** - Merlan bleu; **Sp** - Bacaladilla.



(after Bini, 1969)

Fig. 112

Diagnostic Features : Total gill rakers on first arch 26 to 34. **Colour:** blue-grey on the back, paler on the sides, shading to white on the belly. Sometimes a small dark blotch at base of pectoral fin.

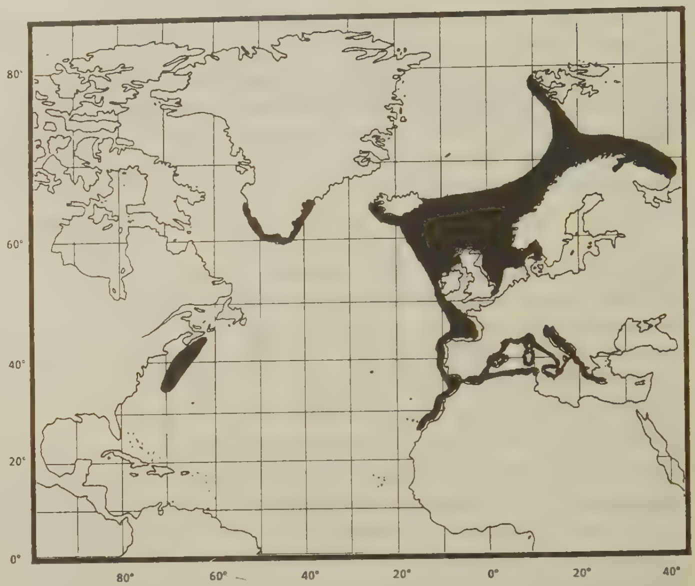


Fig. 113

Geographical Distribution : North Atlantic from the Barents Sea south through the eastern Norwegian Sea, around Iceland, through the eastern Atlantic, in the western Mediterranean, and south along the African coast to Cape Bojador. Also taken around southern Greenland and occasionally off southeast Canada and the northeastern coast of the USA (Fig. 113).

Habitat and Biology : Oceanic and benthopelagic over the continental slope and shelf from 150 to more than 1 000 m, but more common at 300-400 m. Migrates in summer, after spawning, to the North (Faeroes, E. Iceland and Norway) and back to the spawning areas in January-February. Also makes daily vertical migrations: surface waters at night and near the bottom during the day. Reaches its first maturity at 3 years of age. Sex ratio varies geographically: 35% males - 65 % females in Iceland; 46% males - 54% females in the Faeroes; 41% males - 59 % females in W. Scotland; 42% males - 58% females in the Tuscan archipelago. From February to June, 6 000 to 150 000 eggs are laid, the major spawning grounds being the western. UK Islands, but also off Portugal, Bay of Biscay, Faeroes, Norway and Iceland, above the continental shelf. Growth is fast : 1 year = 16 cm; 5 years = 27 to 29 cm; 10 years = 29 to 34 cm. Females are usually larger than males. Maximum age is 20 years (45 cm). Feeds mostly on small crustaceans, but large individuals also prey on small fish and cephalopods.

Size : Reaching 50 cm total length; common from 15 to 30 cm.

Interest to Fisheries : The catch reported in the FAO Yearbook of Fisheries Statistics for 1987 was 708 000 metric tons, of which ca. 693 000 t were taken in the northeastern Atlantic (USSR: ca. 280 000 t, Norway: ca. 193 000 t, Faeroe Islands: ca. 86 000 t, Denmark: ca. 73 000 t, Spain: ca. 29 000 t, Netherlands: ca. 9 000 t, Portugal: ca. 9 000 t, and others), and 15 000 t in the Mediterranean (Spain: ca. 9 000 t, Italy: ca. 3 000 t, Greece: ca. 1 600 t, and others). It is suggested that a stock of several million tons of blue whiting exists in the northeastern Atlantic west of UK, and that the species could sustain an annual yield of over 1 000 000 metric tons (Buzeta & Nakken, 1974, Forbes, 1974).

The Blue whiting is caught mainly with trawls, longlines, trammel nets, gillnets, seines, lamparas and handlines, mostly beyond the edge of the continental shelf. It is marketed fresh and frozen, but a large part of the catch is processed industrially as oil and fishmeal, due to difficulties encountered in the conservation of the flesh, and to the high demand for fishmeal in the eastern European countries. However, considerable research is being conducted, especially in the UK, on new conservation technologies (fish blocks).

Local Names : ALBANIA: Lakuriq, Tripendesh; ALGERIA: Ferkh el bajij; BULGARIA: Putasu; CYPRUS: Gourlomata; DENMARK: Sortmund; EGYPT: Nazelli; FRANCE: Gros poutassou, Merlan bleu, Merlan de Paris, Nasellu; Patafloues, Poutassou, Tacaud; GERMANY: Blauer Wittling; GREECE: Prosfygaki; ISRAEL: Shibbut albin; ITALY: Melu, Potassolo; MALTA: Stokkafixx; MOROCCO: Abadekho; NETHERLANDS: Blawe wijting; NORWAY: Kolmule blagunnar; POLAND: Blekitek; PORTUGAL: Bacalhau, Pichelim; SPAIN: Bacaladilla; TUNISIA: Nazalli azraq; TURKEY: Bakayaro; UK: Blue whiting; USSR: Putassu; YUGOSLAVIA: Pucinca, Ugotica.

Literature : Raitt (1968); Bini (1969); Buzeta & Nakken (1974); Forbes (1974).

Molva

GADI Molv

Genus with Reference : ***Molva*** LeSueur, 1819, Mem.Mus.Hist.Paris, 5:158.

Diagnostic Features : Jaws with strongly developed teeth. No barbel-like flap on nostrils. Two dorsal fins and one anal fin, neither connected with caudal fin; first dorsal fin with 10 to 15 similar rays; pelvic fin without two greatly elongated rays; neither pectoral nor pelvic extend to beginning of anal fin. Lateral line continuous until end of dorsal and anal fin bases, interrupted beyond. Lateral-line canal on head with pores.

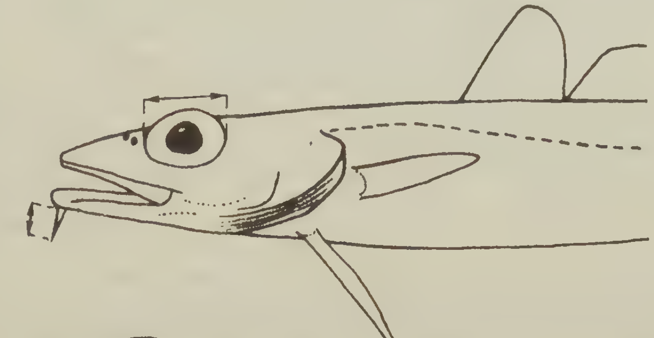
Habitat, Distribution and Biology : Demersal at depths of 150 to 1 000 m. Found in the North Atlantic and Mediterranean.

Interest to Fisheries : Fished commercially.

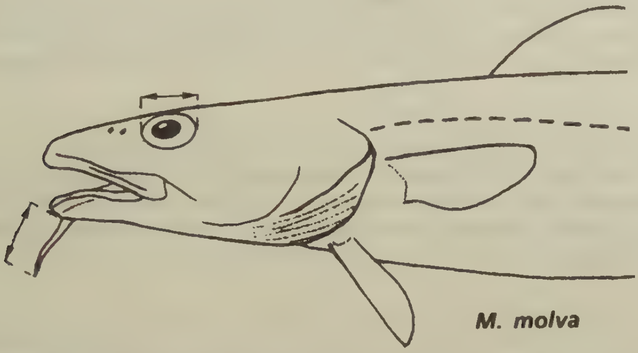
Key to species:

1a. Barbel shorter than eye (Fig. 114). Second dorsal fin rays 69 to 83. Anal fin rays 70 to 81 .... ***M. dypterygia***

1b. Barbel longer than eye (Fig. 115). Second dorsal fin rays 59 to 70. Anal fin rays 57 to 66 .... ***M. molva***



M. dypterygia Fig. 114



M. molva Fig. 115

Molva dypterygia (Pennant, 1784)

Fig. 116

GADI Molv 1

Scientific Name with Reference : ***Gadus dypterygius*** Pennant, 1784, Arctic Zool., 1:76.

Synonyms : ***Gadus byrkelange*** Walbaum, 1792; ***Gadus abyssorum*** Nilsson, 1832; ***Molva abyssorum,*** Nilsson, 1855; ***Molva byrkelange,*** Malm, 1877; ***Molva dipterygia,*** Smitt, 1893; ***Molva dipterygia dipterygia,*** Svetovidov, 1948.

FAO Names : En - Blue ling; **Fr** - Lingue bleue; **Sp** - Maruca azul.

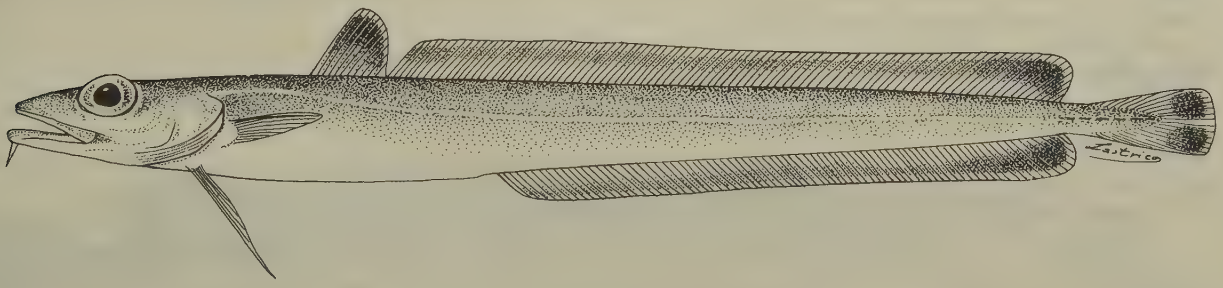


Fig. 116

Diagnostic Features : Lower jaw longer than upper; barbel shorter than eye. Second dorsal fin with 69 to 83 rays; anal fin with 70 to 81 rays; pelvic fin reaching beyond end of pectoral fin. **Colour:** dorsally grey to brown, shading to white ventrally. Posterior region of vertical fins dark with pale margins.

Geographical Distribution : Southwestern Barents Sea, sometimes north to Spitsbergen, west to Greenland and Newfoundland; southern coast of Iceland, around the British Isles and south to Morocco and into the Mediterranean (Fig. 117).

Habitat and Biology : Bottom-dwelling at depths from 150 to 1 000 m, mostly from 350 to 500 m, on muddy bottoms. The males reach first maturity at 9 years (75 cm), and the females at 11 years (88 cm). Spawns from April to May at 500 to 1 000 m depth from W. Scotland to Norway and from the Faeroes to S. Iceland; and from the end of winter to early spring at 500-600 m depth in the Mediterranean. Females grow faster than males: at 3 years, 40 cm; then 5-6 cm every year. Seventeen-year-old males reach 115 cm and 20 year-old females, 155 cm. Feeds on crustaceans and fish (flatfishes, gobies, rocklings).

Size : Reaches 155 cm total length.

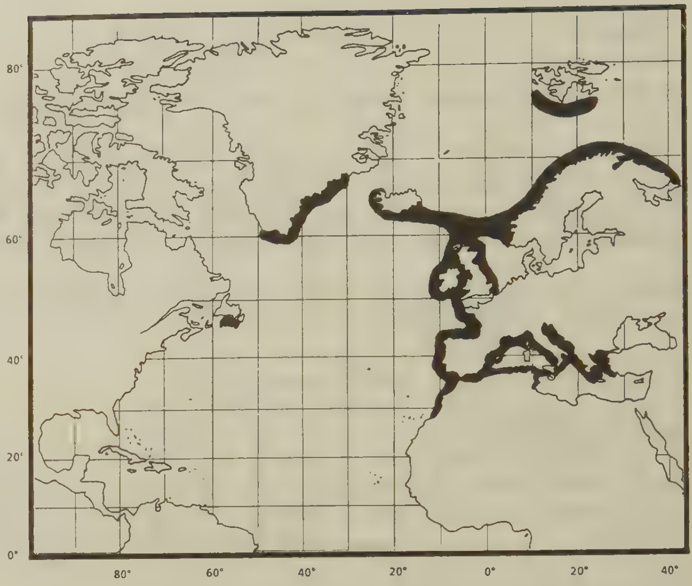


Fig. 117

Interest to Fisheries : Commercially fished with bottom trawls and longlines,especially in the northeastern Atlantic. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics totalled 27 365 metric tons, all from the northeastern Atlantic (France: ca. 13 300 t, Faeroe Islands: 7 000 t, Norway: ca. 4 490 t, and others). Also taken in industrial and artisanal fisheries in the Mediterranean. Marketed frozen and as fresh fillets (Mediterranean), but, also reduced to fish meal.

Local Names : ALGERIA: Lingue espagnole; BELGIUM: Blauwe leng; DENMARK : Byrkelange; FINLAND : Tylppapyrstoinen molva; FRANCE : Lingue batarde, Lingue bleue, Lingue espagnole; GERMANY: Blauleng; GREECE: Glafkopontikopsaro; ICELAND: Blalanga; ITALY: Molva occhiona; MALTA: Linarda; NETHERLANDS: Blauwe leng; NORWAY: Blalange; POLAND: Molwa nibieska; SPAIN: Arbitán, Escolá; SWEDEN: Birkelanga blalange; UK: Blue Ling; USSR: Bolsheglazaya Mol'va.

Literature : Svetovidov (1948); Fraser-Brunner & Palmer (1951); Andriashev (1954); Fischer, Bauchot & Schneider, eds (1987).

Remarks : The northern form, scientific names for which are given above, grades into a southern population known variously as ***M. dypterygia macrophthalma, M. macrophthalma, M. dipterygia elongata,*** and ***M. elongata,*** which is of no interest to fisheries.

Molva molva (Linnaeus, 1758)

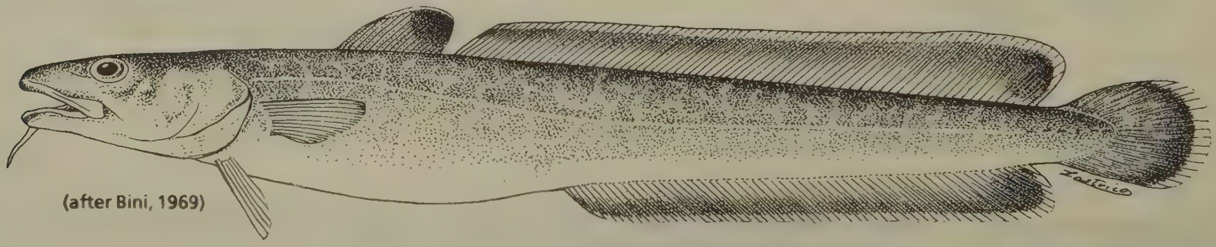
Fig. 118

GADI Molv 2

Scientific Name with Reference : ***Gadus molva*** Linnaeus, 1758, Syst.Nat., ed. 10:254.

Synonyms : ***Molva vulgaris*** Fleming, 1828; ***Gadus raptor*** Nilsson, 1832; ***Molva linnei*** Malm, 1877; ***Lota mola*** Moreau, 1881; ***Molva molva,*** Smitt, 1893.

FAO Names : En - Ling; **Fr** - Grande lingue; **Sp** - Maruca.



(after Bini, 1969)

Fig. 118

Diagnostic Features : Jaws subequal; barbel longer than eye. Second dorsal fin with 59 to 70 rays; anal fin with 57 to 66 rays; pelvic fin not reaching beyond end of pectoral fin. **Colour:** dorsally reddish brown, shading to white ventrally; posterior areas of vertical fins dark with pale margins.

Geographical Distribution : Barents Sea and Iceland to Morocco; rare in the northwestern Mediterranean, off southern Greenland, and Canada (Fig. 119).

Habitat and Biology : Demersal on rocky bottoms at depths of 15 to 600 m or more, commonly from 100 to 400 m. Young up to 1-2 years of age are coastal (15-20 m depth) and pelagic; fish of 3 years migrate to greater depths. First maturity is reached at 5 years for males (80 cm) and 5-6 years for females (90-100 cm). Spawning occurs from March to July and eggs are pelagic. Fecundity may reach 20 to 60 million eggs per female. Major spawning grounds are located at 200 m depth from the Bay of Biscay to the Gulf of Norway at 100 to 300 m off southern Iceland, and at 50 to 300 m in the Mediterranean Sea. Growth is rapid (8-10 cm/year): at 1 year, 20 cm; 2 years, 31-35 cm; 3 years, 31-35 cm; 4 years, 73-83 cm. Females grow faster than males. The maxi-mum age is 10 years for males and 14 for females (ca. 200 cm total length). Feeds mostly on fish (cod, herring, flatfish) but also on crustaceans (lobsters), cephalopods and echinoderms (starfishes).

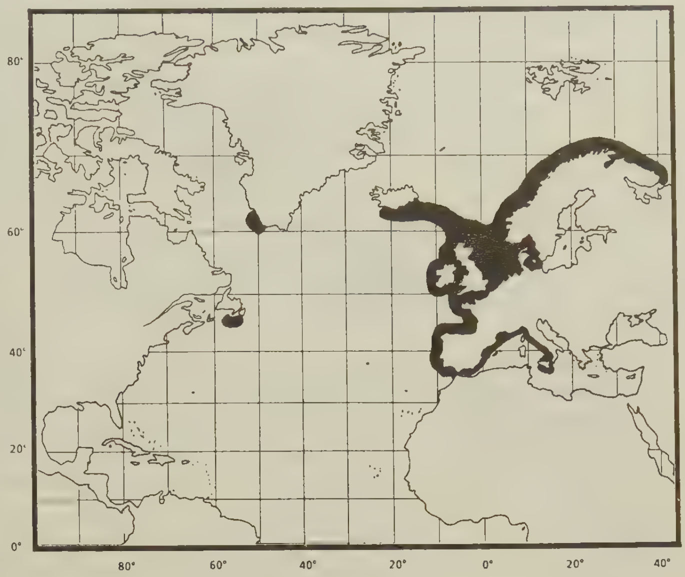


Fig. 119

Size : Reaching 200 cm total length; common from 63 to 160 cm .

Interest to Fisheries : Locally abundant. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics totalled 58 124 metric tons, all from the northeastern Atlantic (Norway: ca. 20 500 t, France: ca. 13 000 t, UK: ca. 7 500 t, Spain: ca. 6 500 t, Iceland: ca. 4 000 t, Faeroe Islands: ca. 3 000 t, Denmark: ca. 1 500, and others). Fished with bottom trawls, longlines, gillnets and handlines. Marketed frozen, as fresh fillets, dried, salted, in brine and also as fishmeal.

Local Names : ALGERIA: Lingue; BELGIUM: Leng; BULGARIA: Molva; DENMARK : Lange; FINLAND: Molva, Pyjoreapyrstoinen; FRANCE : Elingue, Lingue, Lingue franche, Julienne, Morue lingue, Tutchuela; GERMANY: Leng; GREECE: Pentiki, Pontikópsaro; ICELAND: Langa; ITALY: Molva; MALTA: Lipp; NETHERLANDS: Leng; NORWAY: Lange; POLAND: Molwa; PORTUGAL : Donzela; SPAIN : Lengua de bacalá, Maruca; SWEDEN: Langa; TURKEY: Gelincik; UK : Ling; USSR: Molva; YUGOSLAVIA: Mantiz morski.

Literature : Svetovidov (1948); Fraser-Brunner & Palmer (1951); Andriashev (1954); Bini (1969).

Phycis

GADI Phyc

Genus with Reference : *Phycis* Artedi, 1792, in Walbaum, Artedi Gen.Pisc., 575.

Diagnostic Features : Two dorsal fins and one anal fin, neither connected with caudal fin; first dorsal fin with eight or more rays; anal fin not greatly indented; pectoral fin not reaching beyond anal fin origin; pelvic fin with two elongated rays. Lateral-line system on head with pores. Opisthotic bone at rear of skull with large processes for attachment of pectoral girdle; post-temporal and supracleithrum well developed.

Habitat, Distribution and Biology : Three North Atlantic benthopelagic species.

Interest to Fisheries : Two eastern Atlantic species of minor importance.

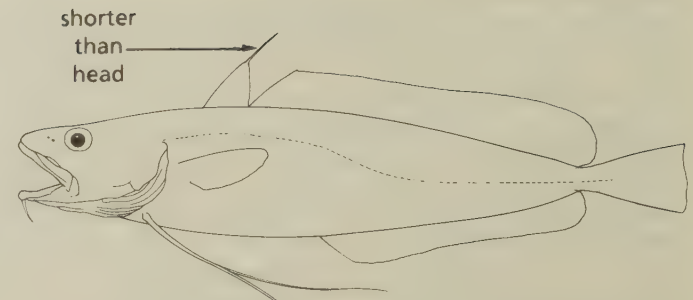
Key to species:

1a. Elongated rays of pelvic fin reaching beyond origin of anal fin. Scale rows between first dorsal fin and lateral line 5 to 7

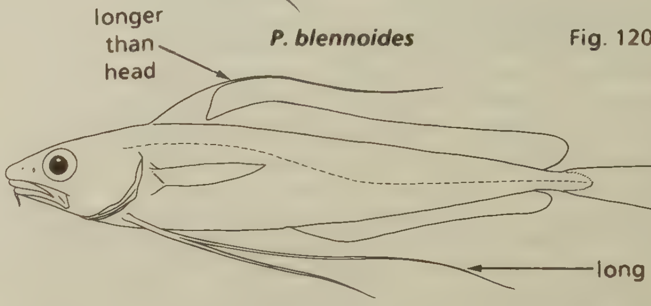
  2a. Longest ray in first dorsal fin no longer than head. Longest ray in pelvic fin falling far short of end of anal fin base (Fig. 120) .... ***P. blennoides***

  2b. Longest ray in first dorsal fin longer than head. Longest ray in pelvic fin reaching nearly to or beyond end of anal fin base (Fig. 121) .... ***P. chesteri***

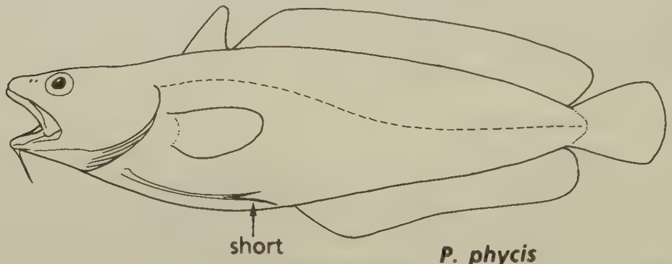
1b. Elongated rays of pelvic fin not reaching beyond origin of anal fin base. Scale rows between first dorsal fin and lateral line 11 or 12 (Fig. 122) .... ***P. phycis***



P. blennoides Fig. 120



P. chesteri Fig. 121



P. phycis Fig. 122

Phycis blennoides (Brunnich, 1768)

Fig. 123

GADI Phyc 1

Scientific Name with Reference : ***Gadus blennoides*** Brunnich, 1768, Ichth.Massil.:24.

Synonyms : ***Gadus albidus*** Gmelin, 1789; ***Gadus bifurcus*** Walbaum, 1792; ***Blennius gadoides*** Lacépède, 1800; ***Phycis tinca*** Bloch & Schneider, 1801; ***Batrachoides gmelini*** Risso, 1810; ***Phycis furcatus*** Fleming, 1828.

FAO Names : En - Greater forkbeard; **Fr** - Physis de fond; **Sp** - Brótola de fango.

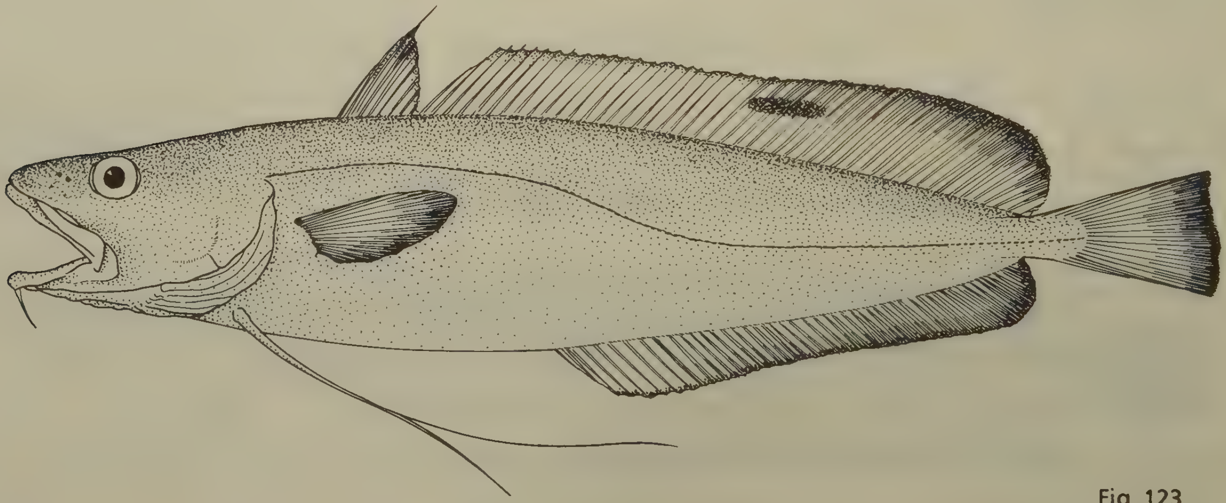


Fig. 123

Diagnostic Features : First dorsal fin with an elongate ray; elongated rays of pelvic fin reaching well beyond origin of anal fin; 5 or 6 scales between first dorsal fin and lateral line. **Colour**: brown to red-grey dorsally, ventrally pale. Vertical fins with dark margins, often an elongate dark blotch at midlength of the second dorsal.

Geographical Distribution : From Norway at about 69°N and Iceland to Cape Blanc, West Africa, and including the Mediterranean (Fig. 124)

Habitat and Biology : Benthopelagic over sand and mud bottoms from 10 to 800 m depth, mostly at 100 to 450 m. Young are more coastal and live on the continental shelf while adults migrate along the slope. Reaches first maturity at 18 cm (males) and 33 cm (females). Spawns from January to May in the Mediterranean and from spring, extending to beginning of summer in the northeastern Atlantic. Growth is slow; females grow faster: at 4 years, 24 cm females and 23 cm males; 5 years, 26 cm females and 24 cm males; 6 years, 28 cm females and 25 cm males. Maximum age, 20 years. Feeds mainly on crustaceans and fishes. Individuals smaller than 15 cm do not eat fish, and adults do not feed on copepods and amphipods.

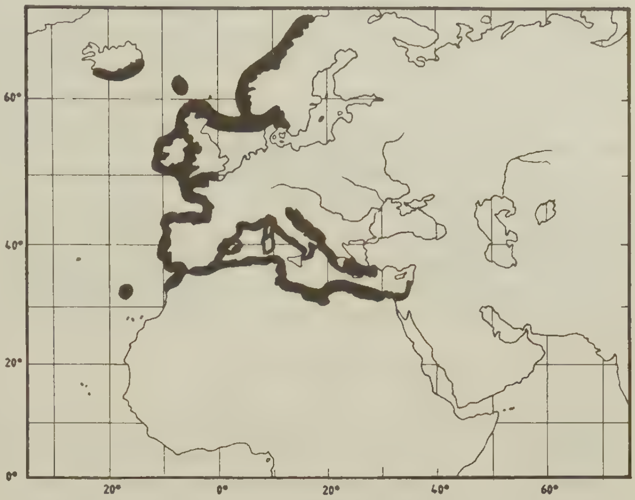


Fig. 124

Size : Reaching 110 cm total length, but commonly less than 45 cm.

Interest to Fisheries : Of rather minor importance. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics totalled 1 612 metric tons, of which 814 t were taken in the northeastern Atlantic (mostly by Spain and France); and 655 t in the Mediterranean (Spain); and 143 t in the Eastern Central Atlantic. Caught mainly with bottom trawls and longlines, also with gillnets and handlines. Marketed fresh and as fillets (also fishmeal). It is difficult to preserve.

Local Names : ALBANIA: Peshk-fik i bardhë; CYPRUS: Malactos; DENMARK: Skaelbrosme; FRANCE : Capelan, Loche, Longue barbe, Moille, Moustelle, Mostelle de fond, Moustelo blanco, Moustelo de roco, Mustella, Phycis de fond; GERMANY: Gabeldorsch; GREECE: Lasposaloúvardos, Ponticos; ISRAEL: Dunim ha-mikhmoret; ITALY: Musdea, Musdea bianca, Pastenula; MALTA: Lipp abjad; MAROC: Bartola, Mostela; MONACO: Mustela de fundu; NETHERLANDS: Gaffelkabeljauw; NORWAY: Skellbrosme; POLAND: Bialy widlak; PORTUGAL: Abrotea, Ricardo; SWEDEN: Fjallbrosme, Kumrill; SPAIN: Brotola de fango, Mollera pigada; SYRIA: Kharraye mouassata; TUNISIA: Mostia kabirah; TURKEY: Gelincik; UK: Greater fork-beard; USSR: Bolsheglaziy niteperiy nalim; YUGOSLAVIA: Tabinja bjaltica.

Literature : Svetovidov (1948); Bini (1969); Fischer, Bauchot & Schneider, eds (1987).

Phycis chesteri **Goode & Bean, 1878**

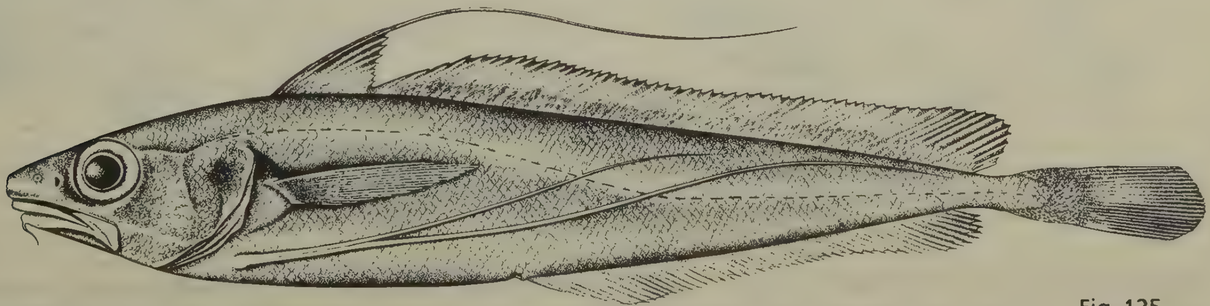
Fig. 125

GADI Phyc 3

Scientific Name with Reference : ***Phycis chesteri*** Goode & Bean, 1878, Proc.US Nat.Mus., 1:256.

Synonyms : None.

FAO Names : En - Longfin hake; **Fr** - Merluche à longues nageoires.



(drawing by K. Moore, Washington)

Fig. 125

Diagnostic Features : Longest ray in first dorsal fin longer than head; longest ray in pelvic fin reaching to or beyond posterior end of anal fin base. **Colour:** olive on sides, belly pale; margins of dorsal, caudal and anal fins darker.

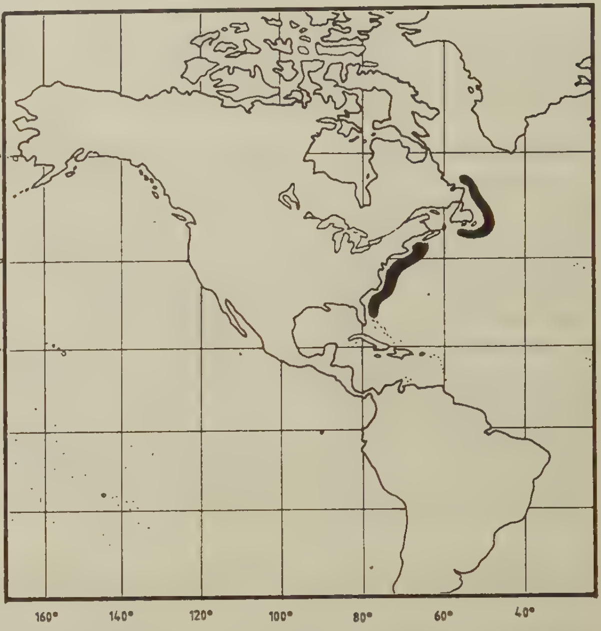


Fig. 126

Geographical Distribution : Outer continental shelves and slopes of the western North Atlantic from at least 56°N to the straits of Florida, but not abundant south of Cape Hatteras (Fig. 126).

Habitat and Biology : Benthopelagic, living on or near the bottom at depths ranging from 90 to ca. 1 400 m, but most abundant between 360 and 800 m. The sex ratio is 1 male for 2.85 females. Spawning occurs on the continental slope from late September to April with a peak in December and January. A 36 cm fish could lay 1 300 000 eggs. Feeds mostly on crustaceans but also on molluscs and fishes.

Size : Reaches nearly 40 cm total length.

Interest to Fisheries : An abundant but rather soft-bodied fish. It has never been fished commercially, but is trawled on the continental slope from Nova Scotia to southern Virginia at 230 to 1 370 m depth. It was found to be most abundant between 500 and 700 m depth. Perhaps a potential fishery. Separate statistics are not reported for this species.

Local Names : CANADA: Longfin hake, Merluche à longues nageoires; USA: Longfin hake

Literature : Wenner (1983) gives an excellent discussion of the life history.

Phycis phycis (Linnaeus, 1766)

Fig. 127

GADI Phyc 2

Scientific Name with Reference : ***Blennius phycis*** Linnaeus, 1766, Syst.Nat., ed. 12:442.

Synonyms : ***Tinca marina*** Walbaum, 1792; ***Phycis mediterraneus*** Delaroche, 1809; ***Phycis furcatus*** S. Bowdich, 1825; ***Phycis limbatus*** Valenciennes, 1838.

FAO Names : En - Forkbeard; **Fr** - Phycis de roche; **Sp** - Brótola de roca.

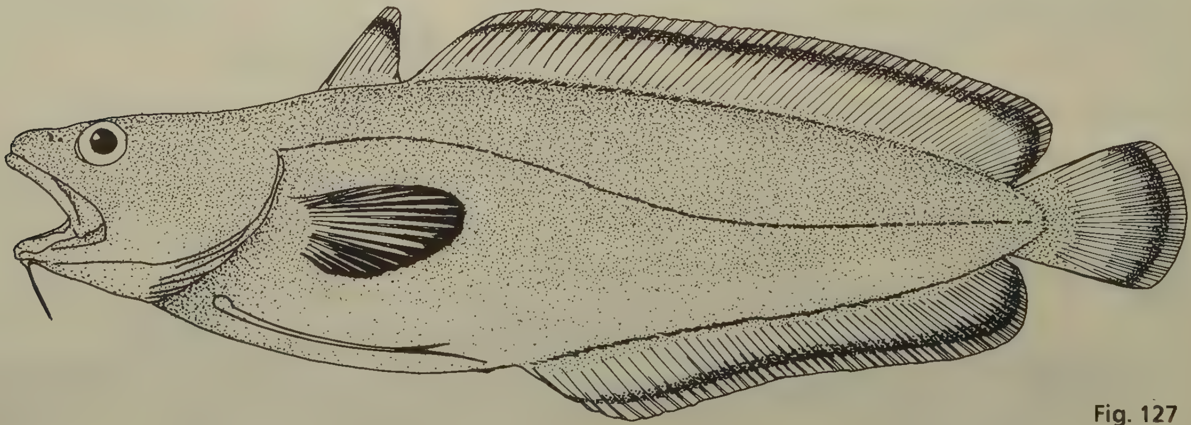


Fig. 127

Diagnostic Features : First dorsal fin with no elongate ray; elongated rays of pelvic fin reaching at most to origin of anal fin; 11 or 12 scale row between first dorsal fin and lateral line. **Colour:** brownish-red dorsally, somewhat paler ventrally; vertical fins distally dark, sometimes with a pale margin.

Geographical Distribution : Northeast Atlantic from the Bay of Biscay to Morocco, south to Cape Verde and including offlying islands. Also in the Mediterranean and at the Azores (Fig. 128).

Habitat and Biology : Benthopelagic, on hard and on sandy-muddy bottoms near rocks at 100 to 650 m, but sometimes taken at greater depths. Common from 100 to 200 m depth. Active at night and hides between rocks during the day. Spawns from January to May throughout its entire Mediterranean range. Feeds on small fish and various invertebrates.

Size : May reach 60 cm total length, but more commonly 25 cm or less.

Interest to Fisheries : Limited. Caught with trawls, gill nets, longlines, traps and hand lines, incidental to other fishing. Marketed regularly in Spain, Morocco, Italy and Yugoslavia, usually fresh. Separate statistics are not reported for this species.

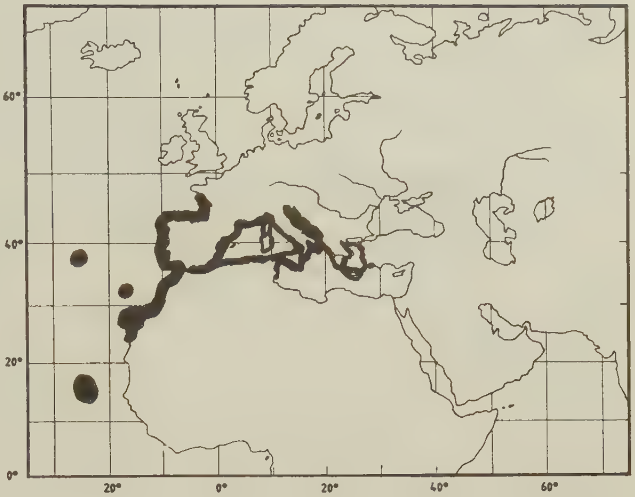


Fig. 128

Local Names : ALBANIA: Peshk-fik i zi; CYPRUS: Salouvardas; FRANCE: Mostelle de roche, Phycis de roche; GREECE: Petrosaloúlvardos; ISRAEL: Dunim ha-sel'aim; ITALY: Musdea, Musdea Bianca; MALTA: Lipp tal-qawwi; MONACO: Moustela de rocas; PORTUGAL: Abrotia; SPAIN: Brótola de roca, Móllera roquera; TUNISIA: Mostia saghirah; TURKEY: Gelincik; UK: Fork-beard; USSR: Obyknovenniy niteperiy nalim; YUGOSLAVIA: Tabinja mrkulta.

Literature : Svetovidov (1948); Bini (1969); Fischer, Bauchot & Schneider, eds (1987).

Pollachius

GADI Pol

Genus with Reference : ***Pollachius*** Nilsson, 1832, Prodr.Ichth.Scand.:43.

Diagnostic Features : Lower jaw longer than upper. Three dorsal fins and two anal fins; dorsal fins relatively close together; first anal fin base longer than one-half of preanal distance. Lateral-line canals on head with pores. Lateral line continuous to about middle of third dorsal fin.

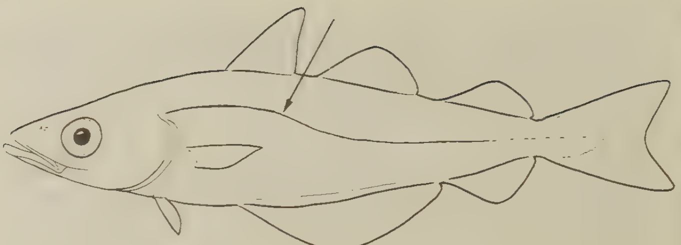
Habitat, Distribution and Biology : Benthopelagic to pelagic, mostly in coastal waters, generally at depths less than 300 m in the temperate to arctic North Atlantic and adjacent seas.

Interest to Fisheries : Only one of the two known species is commercially important.

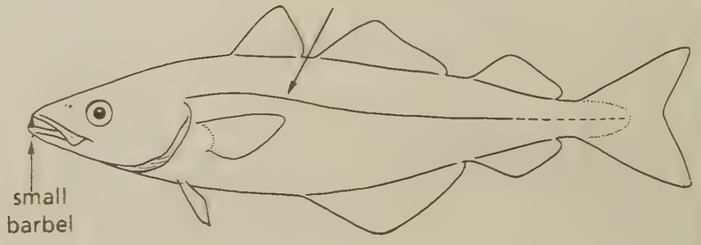
Key to Species

1a. Barbel absent at tip of lower jaw. Lateral line with a sharp dip between first and second dorsal fins (Fig. 129) .... ***P. pollachius***

1b. A small barbel present at tip of lower jaw. Lateral line smooth along its entire length (Fig. 130) .... ***P. virens***



P. pollachius Fig. 129



P. virens Fig. 130

Pollachius pollachius (Linnaeus, 1758)

Fig. 131

GADI Pol 1

Scientific Name with Reference : ***Gadus pollachius*** Linnaeus, 1758, Syst.Nat., ed. 10:254

Synonyms : ***Gadus lycostomus*** Faber, 1828; ***Merlangus pollachius,*** Fleming, 1828; ***Pollachius typus*** Bonaparte, 1846; ***Gadus viridis*** Gronow, 1854; ***Pollachius linnei*** Malm, 1877; ***Merlangus pollachius,*** Moreau, 1881.

FAO Names : **En** - Pollack; **Fr** - Lieu jaune; **Sp** - Abadejo.

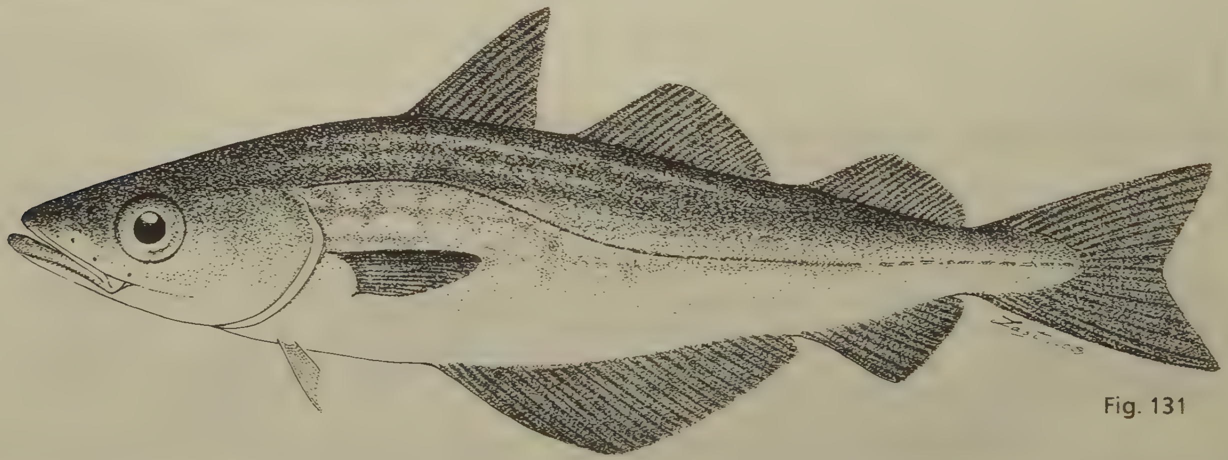


Fig. 131

Diagnostic Features : No barbel at tip of lower jaw. Lateral line with a sharp dip between first and second dorsal fins. **Colour:** variable, dorsally dark, sharply distinguished from silver-grey sides and belly, upper part of body with yellow to orange streaks or blotches. Fins uniformly dark except for yellowish pelvics. Lateral line greenish.

Geographical Distribution : Northeastern Atlantic from Norway, the Faeroes (rare) and Iceland to the Bay of Biscay (Fig. 132).

Habitat and Biology : Pelagic to benthopelagic, mostly close to shore but up to 200 m depth over hard bottoms. Young are pelagic and live near the coast up to 3 years, then migrate to the open sea where they are found mostly between 40 and 100 m depth. Spawns in March in the Bay of Biscay, in February in Spain, and in May in Norway, at ca. 150 m depth. Growth is rapid but slower in the north. At 5 years, the fish attain lengths of 63 cm in the Bay of Biscay, 65 cm off Spain, 59 cm in the Celtic Sea and 52 cm off W. Ireland. Maximum age and size are 8 years and 75 cm. Feeds mostly on fish and incidentally on cephalopods and crustaceans (shrimps and crabs).

Size : Possibly reaching 130 cm total length, but 75 cm is more common.

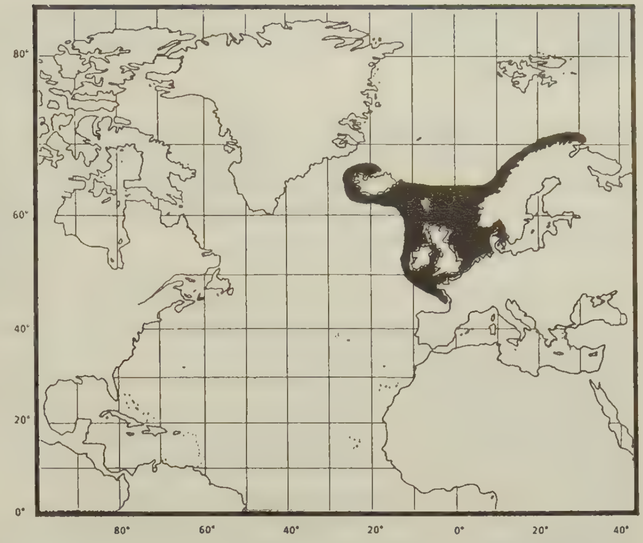


Fig. 132

Interest to Fisheries : Not particularly important commercial fish. The catch for 1987 reported in the FAO Yearbook of Fishery Statistics totalled 17 900 metric tons, all from the northeastern Atlantic (France: ca. 8 300 t; Spain: ca. 2 900 t; UK: ca. 2 600 t; Norway; ca. 1 500 t; Denmark: 1 100 t; Ireland: 950 t and others. The major fishing grounds are the Celtic Sea, the English Channel, and the northern Bay of Biscay. Caught with bottom or pelagic trawls, longlines and gillnets. Marketed fresh and frozen.

Local Names : DENMARK: Lubbe; FRANCE: Colin, Lieu jaune, Merluche blanche; GERMANY : Pollack; ITALY: Merluzzo giallo; NETHERLANDS: Pollak, Witte koolvis; NORWAY: Lyr; POLAND: Grazniak, Rdzawiec; PORTUGAL: Bacalhau; SWEDEN: Bleka, Lyrtorsk; UK: Lythe, Pollack.

Literature : Svetovidov (1948); Andriashev (1954); Wheeler (1969).

Pollachius virens (Linnaeus, 1758)

Fig. 133

GADI Pol 2

Scientific Name with Reference : ***Gadus virens*** Linnaeus, 1758, Syst.Nat., ed. 10:254.

Synonyms : ***Gadus carbonarius*** Linnaeus, 1758; ***Gadus colinus*** Lacépède, 1800; ***Gadus sey*** Lacépède, 1800; ***Gadus purpureus*** Mitchill, 1815; ***Merlangus virens*** Fleming, 1828; ***Merlangus carbonarius,*** Fleming, 1828; ***Merlangus purpureus,*** Storer, 1846; ***Pollachius carbonarius,*** Gill, 1864.

FAO Names : En - Saithe; **Fr** - Lieu noir; **Sp** - Carbonero.

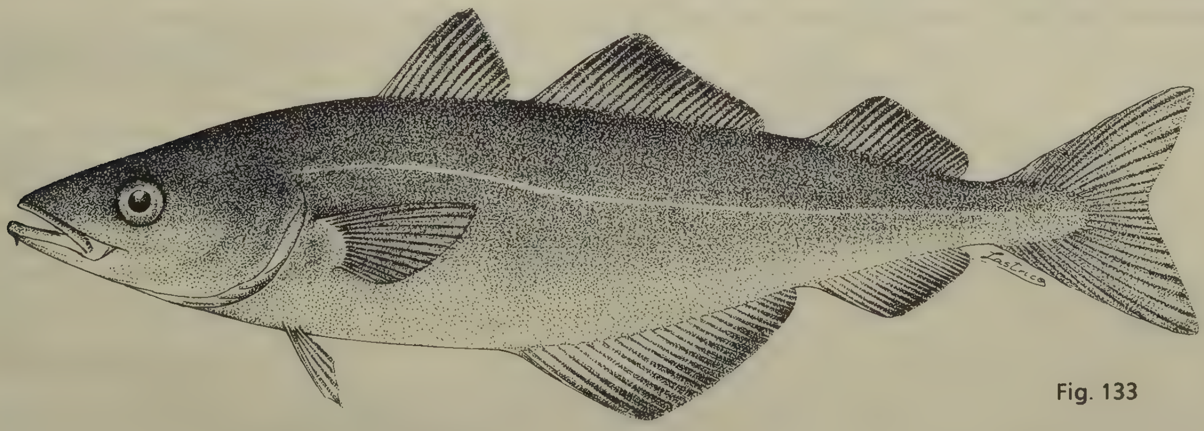


Fig. 133

(adapted from Svetovidov, 1948)

Diagnostic Features : A small barbel at tip of lower jaw. Lateral line smooth along its entire length. **Colour:** brownish-green dorsally, only slightly paler ventrally; fins coloured like the body, except for pelvics which are pale; lateral line pale.

Geographical Distribution : Barents Sea and Spitsbergen to Bay of Biscay, around Iceland, southwest Greenland, and in the western Atlantic from Hudson Strait to North Carolina, although rare at the extremes of the range (Fig. 134).

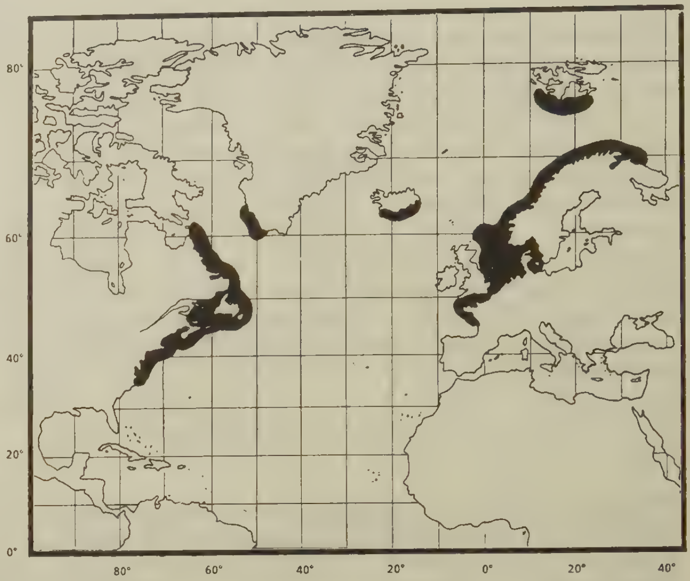


Fig. 134

Habitat and Biology : An active, gregarious, pelagic fish occurring in inshore and offshore waters to about 200 m depth. Migrations are known to occur, especially for spawning, to coastal waters in spring and to deeper waters in winter. Also, long-distance north-south migrations are known, both for Europe and America. During their first 2-3 years of age, saithe remain in shallow coastal waters. Growth is rapid: at 1 year, ca. 20 cm, 2 years, 35 cm, 3 years, 50 cm, 5 years, 60-65 cm, 10 years, 94-97 cm, 15 years, 108 cm. Maximum age is 25 years. European saithe grow faster in the southern part of their range, but it is not known whether this also applies to the North American population. First maturity is reached between 5 and 10 years of age in the European population, and apparently earlier (at 3 years) in the Gulf of Maine. Spawning occurs in late fall and winter; in the western North Atlantic it begins in September and ends in March, with a peak from November to February. Average females lay about 220 000 eggs, but in large fish, the fecundity may reach 4 000 000 eggs per female. Smaller fish in inshore waters feed on small crustaceans (copepods, amphipods, euphausiids) and small fish, while the large saithe prey predominantly upon fishes.

Size : Reaches nearly 130 cm total length; common from 30 to 110 cm.

Interest to Fisheries : An important commercial species, similar to cod and haddock which it replaces in some products. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics totalled 475 981 metric tons, of which 404 102 t, were taken in the northeastern Atlantic (Norway: ca. 148 000 t, Iceland: ca. 78 200 t, France: ca 69 900 t, Faeroe Islands: ca 41 600 t, Germany: ca. 28 800 t, UK: ca. 22 700 t, Denmark: ca. 8 200 t, and others), and 71 879 metric tons in the northwestern Atlantic (Canada: ca. 47 700 t, UK: ca. 20 700 t, France: ca 2 700 t and others). In the northwestern Atlantic, 80% of the catches are taken from October to December when this fish forms large schools. Saithe are caught with purse and Danish seines, trawls (bottom and pelagic), and longlines; also trolling with spoons is used. They are marketed fresh, chilled as fillets, and frozen; also canned, dried-salted and in brine.

Local Names : BELGIUM: Koolvis; CANADA: Pollock; DENMARK: Sej; FRANCE : Colin, Colin noir, Greslin, Lieu noir, Merlan vert, Merluche; GERMANY : Köhler, Seelachs; ITALY: Merluzzo nero; NETHERLANDS: Koolvis; NORWAY: Sei; POLAND: Czarniak; PORTUGAL: Badejo; SPAIN: Bacalao, Carbonero; SWEDEN: Grasej; UK : Coalfish, Coley, Saithe; USA: Pollock; USSR: Saida.

Literature : Svetovidov (1948); Bigelow & Schroeder (1953); Andriashev (1954); Wheeler (1969).

Raniceps

GADI Ran

Genus with Reference : ***Raniceps*** Cuvier in Oken, 1817, Isis:1182.

Diagnostic Features : See species.

Remarks : A single species.

Raniceps raninus (Linnaeus, 1758)

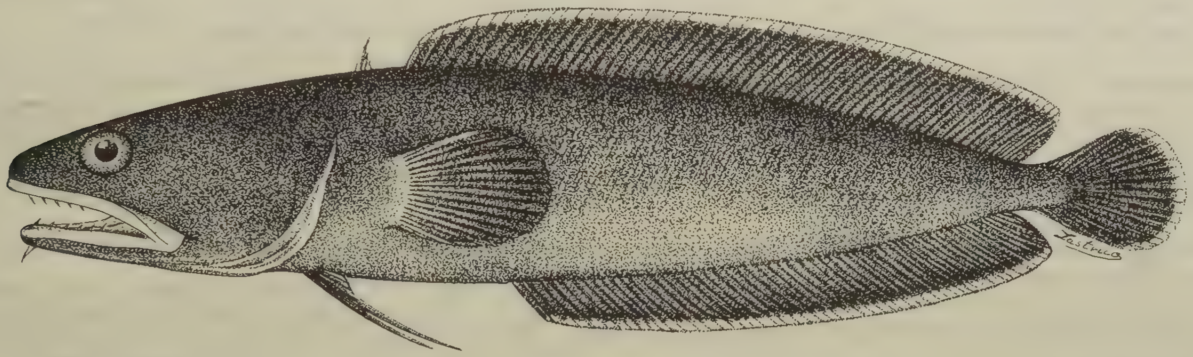
Fig. 135

GADI Ran 1

Scientific Name with Reference : ***Blennius raninus*** Linnaeus, 1758, Syst.Nat., ed. 10:258

Synonyms : ***Blennius fuscus*** Müller, 1776; ***Blennius raninus,*** Müller, 1776; ***Gadus fuliginosus*** Walbaum, 1784; ***Gadus raninus,*** Müller, 1788; ***Gadus trifurcus*** Walbaum, 1792; ***Gadus minimus*** Walbaum, 1792; ***Batrachoides blennioides*** Lacépède, 1800; ***Phycis ranina,*** Schneider, 1801; ***Blennius trifurcatus*** Shaw, 1803; ***Batrachocephalus blennioides,*** Hollberg, 1819; ***Raniceps jago*** Fleming, 1828; ***Raniceps trifurcatus,*** Fleming; ***Raniceps niger*** Nilsson, 1832; ***Raniceps fuscus,*** Kroyer, 1843-45.

FAO Names : **En** - Tadpole fish; **Fr** - Trident.



(after Svetovidov, 1948)

Fig. 135

Diagnostic Features : Head notably depressed. Lower jaw shorter than upper. Chin barbel present. Dorsal fins two, the first poorly developed, with only three short rays; anal fin one, not indented, long based, about equal in length to preanal distance; dorsal and anal fins separate from caudal; pelvic fin somewhat elongated. Neither lateral line on body nor pores on head. **Colour:** a uniform dark brown or bluish brown; lips and distal areas of all fins paler, except for the pectorals.

Geographical Distribution : Found from Trondheim on the Norwegian coast to the Bay of Biscay; also around the British Isles (Fig. 136).

Habitat and Biology : Lives in coastal waters at shallow depths, generally from 10 to 20 m, more seldom from 75 to 100 m, on rocky bottoms with seaweeds. Solitary and secretive, undertakes only limited local movements. Spawns from May to September at 50 to 75 m depth near the shore throughout its entire range. Feeds on sea stars, crustaceans, worms, molluscs and small fish.

Size : Reaches 25-30 cm total length.

Interest to Fisheries : Of no economic importance. Caught occasionally in trawls and on hook and line, but practically useless as food.

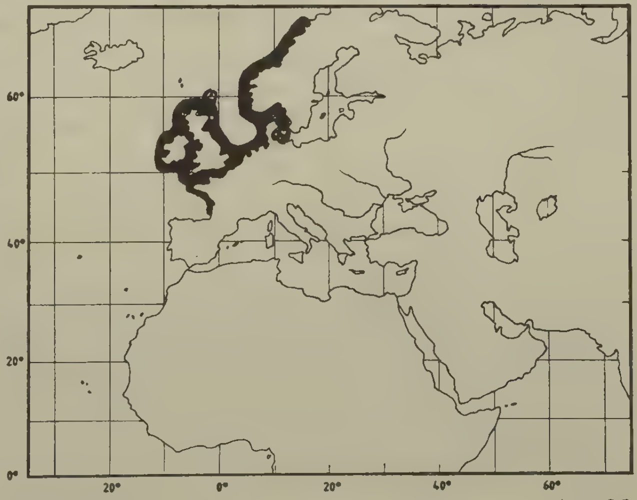


Fig. 136

Local Names : DENMARK: Sortvels; FRANCE: Trident; GERMANY: Froschdorsch; NETHERLANDS: Vorschkval; NORWAY: Paddetorsk

Literature : Svetovidov (1948); Wheeler (1969).

Remarks : Considered a separate family by some ichthyologists (see papers by Dunn, Howes & Markle, in Cohen, 1989).

Theragra

GADI Ther

Genus with Reference : *Theragra* Lucas, 1899, in Jordan & Gilbert, Rept.Fur-seal Rept.Invest., vol. III:486

Diagnostic Features : Lower jaw projecting slightly. Small chin barbel present. Three dorsal fins and two anal fins, all separate from each other; second anal fin with a short base, less than two times the length of first dorsal fin base; pectoral fin usually reaching at least to anal fin origin; pelvic fin with a slightly elongated filament. Lateral line continuous to at least rear end of first dorsal fin base, interrupted posteriorly; head with lateral line pores. Parapophyses not expanded at their tips.

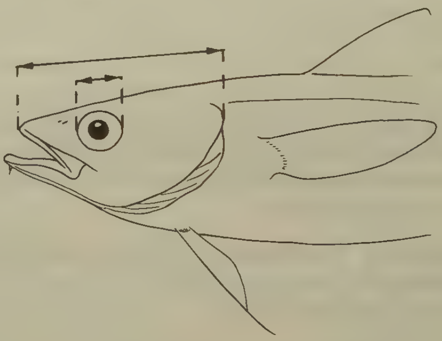
Habitat, Distribution and Biology : Generally pelagic. Widely distributed in the temperate to boreal North Pacific. Also a very rare species off Finnmark in the Northeast Atlantic.

Interest to Fisheries : In the Pacific, a very important fish.

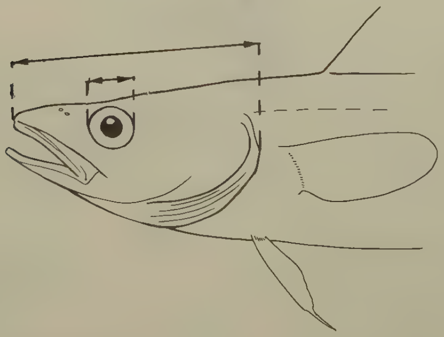
Key to species :

1a. Eye 3.9 to 4.8 times in head length (Fig. 137) .... ***T. chalcogramma***

1b. Eye 5.0 to 5.2 times in head length (Fig. 138) .... ***T. finnmarchica***



T. chalcogramma Fig. 137



T. finnmarchica Fig. 138

Theragra chalcogramma (Pallas, 1811)

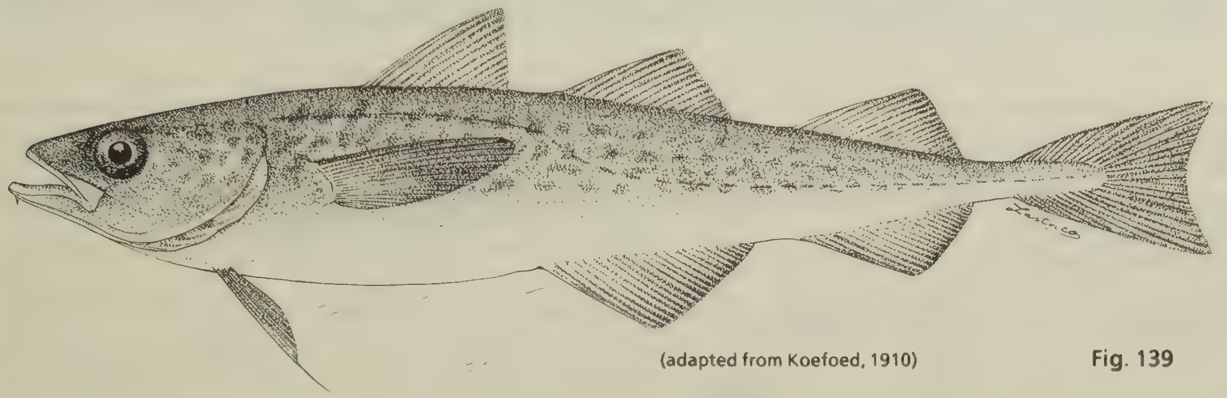
Fig. 139

GADI Ther 1

Scientific Name with Reference : ***Gadus chalcogrammus*** Pallas, 1811, Zoogr. Rosso-Asiat., 3:198.

Synonyms : ***Gadus periscopus*** Cope, 1873; ***Pollachius chalcogrammus,*** Jordan & Gilbert, 1881; ***Gadus minor*** Döderlein, 1887; ***Pollachius chalcogrammus fucensis*** Jordan & Gilbert, 1894; ***Theragra fucensis,*** Jordan & Evermann, 1898; ***Theragra chalcogramma chalcogramma*** natio ***fucensis,*** Svetovidov, 1948.

FAO Names : En - Alaska pollock; **Fr** - Lieu de l'Alaska; **Sp** - Colin de Alaska.



(adapted from Koefoed, 1910)

Fig. 139

Diagnostic Features : Eye 20.7 to 25.7% of head length. Predorsal length 28.1 to 29.2 % total length. Caudal peduncle depth 3.0 to 3.5 % of total length. **Colour:** olive green to brown dorsally, often mottled or blotched; silvery on sides, pale ventrally; fins darker.

Geographical Distribution : Widely distributed in the temperate to boreal North Pacific, from Central California into the eastern Bering Sea, along the Aleutian arc, around Kamchatka, in the Okhotsk Sea and into the southern Sea of Japan (Fig. 140).

Habitat and Biology : Generally demersal, from 30 to below 400 m depth, sometimes near the surface; performs diurnal vertical migrations. Reaches first maturity at 3-4 years (30 to 38 cm total length). Fecundity varies with age: 4 years: 520 000 eggs; 11 years: 15 million eggs for the W Bering Sea stock. Congregates in dense schools to spawn, usually at 50 to 250 m depth. The length of the spawning season varies by area, from 2 to 7 months. Spawns mostly from January to March in the Strait of Georgia and the Aleutian Basin, but spawning occurs much later to the northwest of the Privilof Islands (extending to August) than in the southeastern Bering Sea. Grows rapidly and lives to 14-15 years. The young feed mainly on copepods and their eggs. Adults prey upon shrimps, sand lance and herring in British Columbia, on pink, chum and coho salmon in Alaska; and on mysiids, euphausiids, silver smelt, and capelin in Asian waters. Alaska pollock is preyed upon by fur seals.

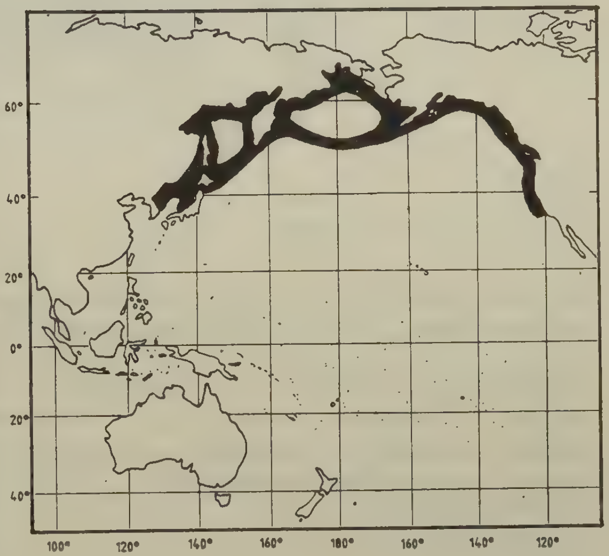


Fig. 140

Size : Reaches 80 cm total length.

Interest to Fisheries : This species contributes the largest of all demersal fish resources; it is composed of 12 major stocks distributed in different areas of the North Pacific. The catch recorded for 1987 in the FAO Yearbook of Fishery Statistics totalled 6 703 868 metric tons, of which 5 009 466 t were taken in the western North Pacific (USSR: ca. 3 420 000 t; Japan: ca. 1 216 000 t; Poland: ca. 230 000 t; and Republic of Korea: ca. 142 200 t), and 1 694 402 t in the eastern North Pacific (USA: ca. 1 38 000 t; Republic of Korea: ca. 289 000 t; Japan: ca. 97 000 t; and others). The largest catches come from the outer shelf and slope of the eastern Bering Sea between the eastern Aleutians and the Privilof Islands, and from waters southwest of St. Mathew Islands. Fishing depth ranges from 90 and 300 m in the Bering Sea, and from 50 to 200 m in the Gulf of Alaska (100-200 m in winter and 50 to 150 m in summer).

The Alaska pollack is caught mostly by pair and stern trawls, Danish seines and longlines; gillnets and dragnets are also used in inshore areas. Trawl and longline fishing is most productive in daytime when the schools are more concentrated near the bottom. Some time ago it was used only for animal feeds, but it has now become an important food resource for humans in the form of frozen blocks (whole or fillets), roe, and salted products.

Local Names : CANADA : Walleye pollock; JAPAN: Sukeso-dara; USA: Alaska pollock; USSR: Mintai.

Literature : Svetovidov (1948); Andriashev (1954); Hart (1973); Niggol (1982); Balykin (1986).

Remarks : Svetovidov (1948), suggested that *T. chalcogramma* divides into geographical races, some of which have been named (see synonymy). Other ichthyologists recognize but a single, named species.

Theragra finnmarchica Koefoed, 1956

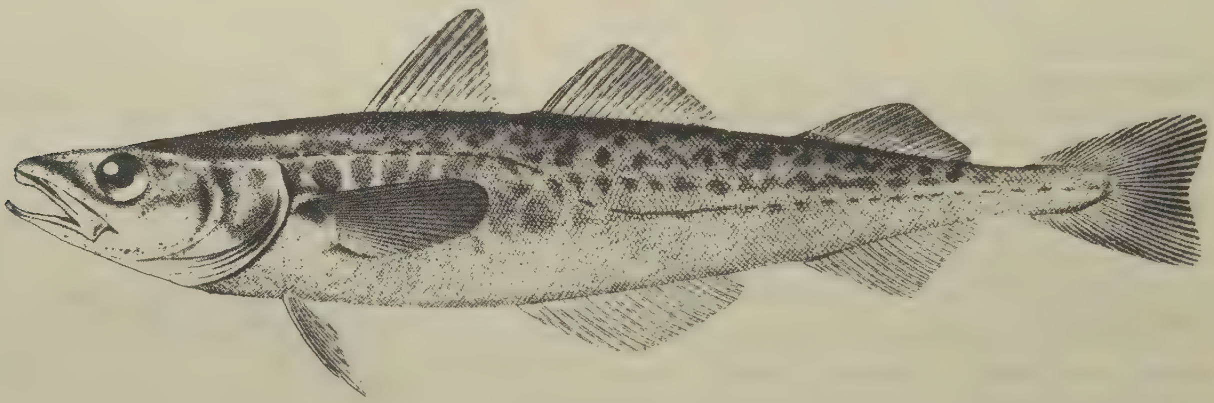
Fig. 141

GADI Ther 2

Scientific Name with Reference : *Theragra finnmarchica* Koefoed, 1956, Fiskeridirekt.Skr. , ser. Havunders., 11(5):3

Synonyms : None.

FAO Names : En - Norwegian pollock; **Fr** - Lieu de Norvège; **Sp** - Colin de Noruega.



(from Svetovidov, 1959)

Fig. 141

Diagnostic Features : Eye 19.2 to 19.9 % of head length. Predorsal length 29.9 to 31.9 % of total length. Caudal peduncle depth 4.0 to 4.6% of total length. **Colour:** Fresh specimens blue dorsally, pale silver-white ventrally.

Geographical Distribution : Known only from the northern tip of Norway (Fig. 142).

Habitat and Biology : Probably a benthopelagic species occurring mainly in midwaters.

Size : Reaches at least 50 cm total length.

Interest to Fisheries : None.

Local Names : NORWAY: Berlevagfish.

Literature : Svetovidov (1959).

Remarks : A rare species, known only from 4 specimens, three caught in 1932, a fourth in 1957.

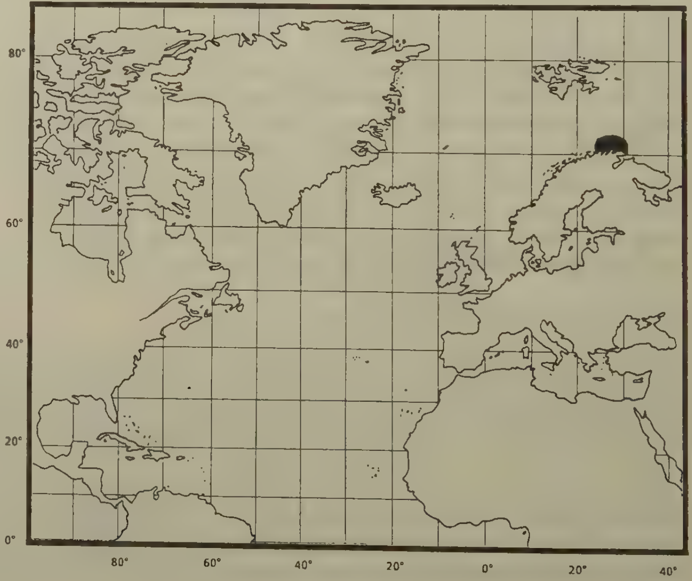


Fig. 142

Trisopterus

GADI Triso

Genus with Reference : ***Trisopterus*** Rafinesque, 1814, Prec.decouv.somiolog.: 16.

Diagnostic Features : Chin barbel well developed. Dorsal fins three; anal fins two, first anal fin with a long base, two times or more the length of the first dorsal fin base; dorsal fins in contact at their bases or with only a very small interspace; anal fin similar; pectoral fin extending beyond origin of anal fin; pelvic fin with a slightly elongated ray. Lateral line continuous for its entire length; lateral line on head with pores.

Habitat, Distribution and Biology : Benthopelagic to pelagic. Found in the eastern Atlantic to Iceland and adjacent areas of the Arctic; also, in the Mediterranean.

Interest to Fisheries : All three species are taken in small to moderate quantities.

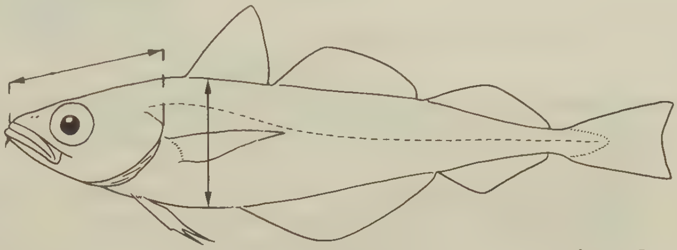
Key to species:

1a. Lower jaw slightly longer than upper. Greatest body depth less than head length (Fig. 143) .... ***T. esmarkii***

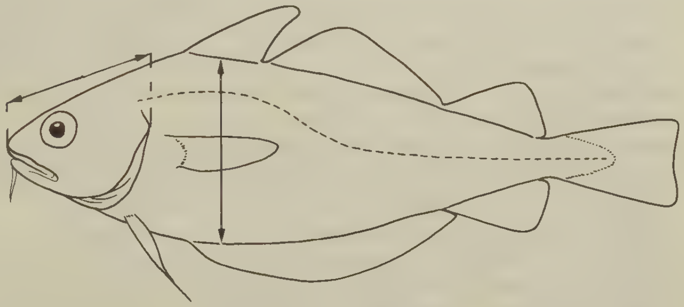
1b. Lower jaw shorter than upper

  2a. Greatest body depth greater than head length (Fig. 144) .... ***T. luscus***

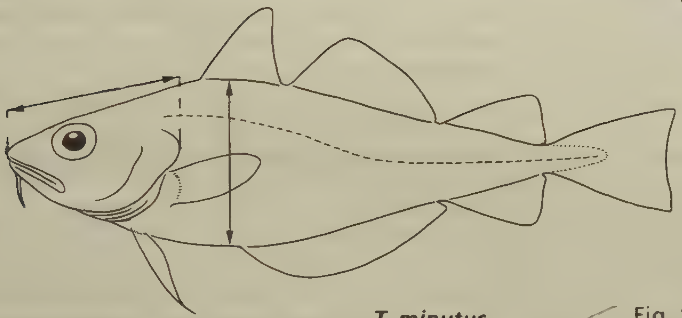
  2b. Greatest body depth equal to or less than head length (Fig. 145) .. ***T. minutus***



T. esmarkii Fig. 143



T. luscus Fig. 144



T. minutus Fig. 145

Trisopterus esmarkii (Nilsson, 1855)

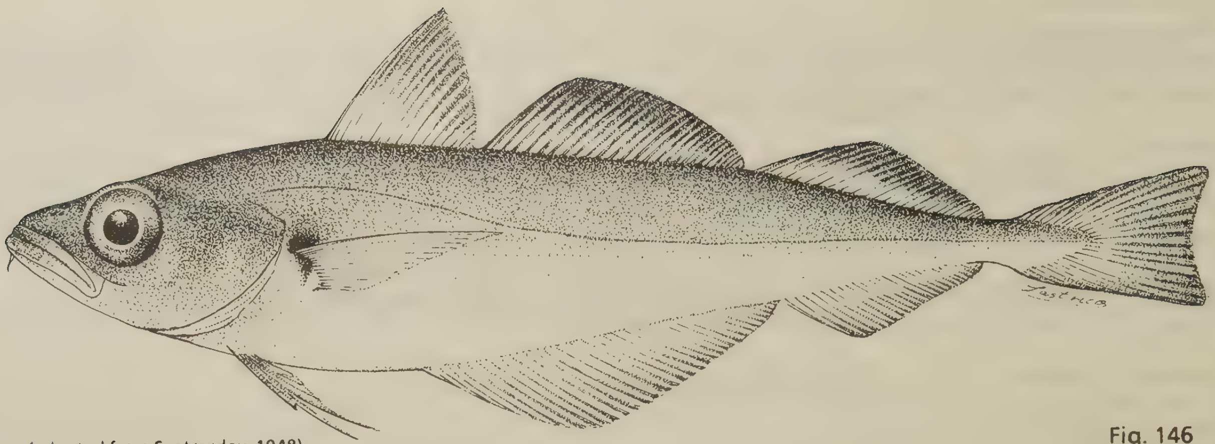
Fig. 146

GADI Triso 3

Scientific Name with Reference : ***Gadus esmarkii*** Nilsson, 1855, Scand.Fauna, 4:565

Synonyms : None

FAO Names : En - Norway pout; **Fr** - Tacaud norvégien; **Sp** - Faneca noruega.



(adapted from Svetovidov, 1948)

Fig. 146

Diagnostic Features : Lower jaw slightly longer than upper. Greatest body depth less than head length. **Colour :** grey-brown dorsally, sides silvery, belly white; a dark blotch at upper edge of pectoral base.

Geographical Distribution : Southwest Barents Sea, sometimes at Bear Island, south to the English Channel, around Iceland, and at the Faeroe Islands (Fig. 147).

Habitat and Biology : Benthopelagic to pelagic over muddy bottoms at depths of 50-300 m, but mostly found between 100 and 200 m. First maturity is reached at 2 years (14 to 15 cm) and sex ratio of adults in the North Sea is 43% males: 57% females. A 15 to 19 cm fish lays 27 000 to 51 200 eggs; the spawning period extends from January to July (mostly from March to May). Migrates for spawning between the Shetland Islands and Norway and out of the Skagerrak, the major spawning grounds being located between NW Scotland, Norway, Faeroe Islands and Iceland. Growth is rapid: at 1 year, 13 cm ; 2 years, 19 cm; 3 years, 21 cm; maximum age is 4 to 5 years. It is a pelagic feeder, mostly on planktonic crustaceans (copepods euphausids, shrimps, amphipods) but also on small fish and various eggs and larvae.

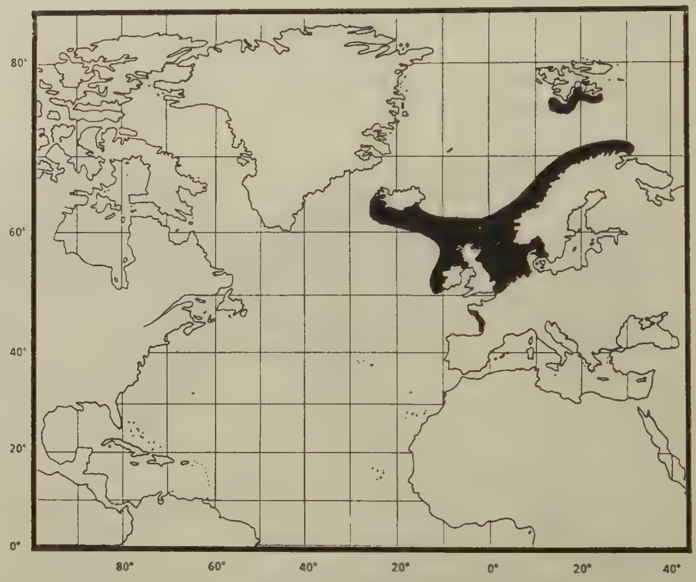


Fig. 147

Size : An exceptional specimen reached 35 cm; however, less than 20 cm is the more ordinary size.

Interest to Fisheries : The catch reported for 1987 in the FAO Yearbook of Fishery Statistics was 321 082 metric tons, down from 878 000 t in 1974. Major exploiting countries are Denmark (ca. 219 000 t), Norway (ca. 81 000 t) and the Faeroe Islands (ca. 20 000 t), using bottom trawls and Danish seines. The major fishing grounds are the northern North Sea and Skagerrak and to a lesser extent, the Norwegian More coast, between 100 and 250 m depth. Used mainly for fish meal and oil.

Local Names : DENMARK: Spaerling; FRANCE : Mostelle de fond, Tacaud norvégien; GERMANY: Stintdorsch; NORWAY: Ogerpal, Skellbrosme; UK: Norway pout.

Literature : Svetovidov (1948); Andriashev (1954); Raitt (1968a).

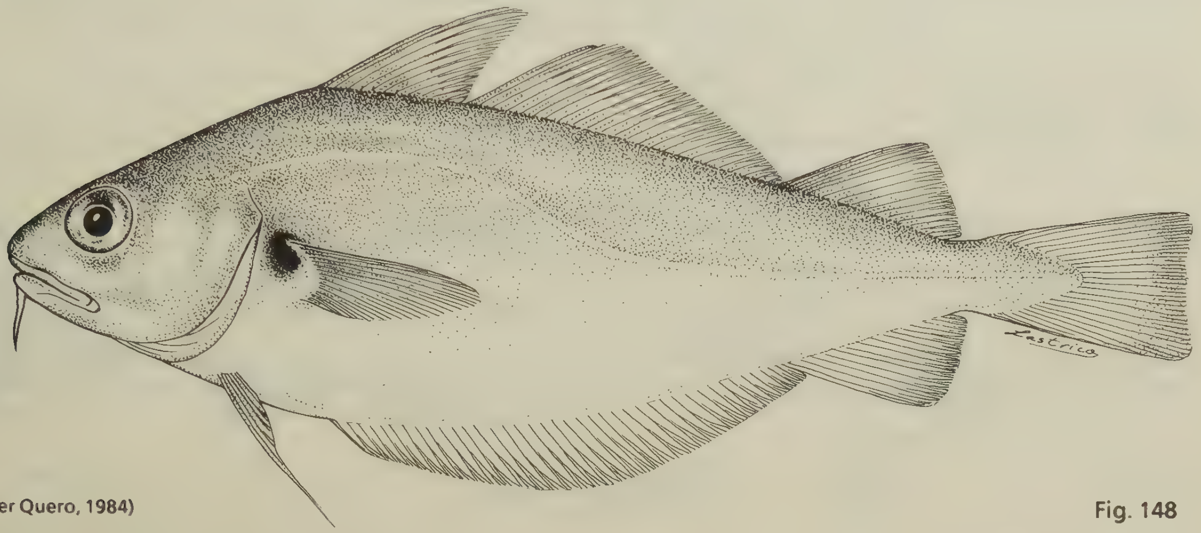
Trisopterus luscus (Linnaeus, 1758) Fig. 148

GADI Triso 2

Scientific Name with Reference : ***Gadus luscus*** Linnaeus, 1758, Syst.Nat., ed. 10:252.

Synonyms : ***Gadus barbatus*** Linnaeus, 1758; ***Gadus bibus*** Lacépède, 1800; ***Morhua lusca,*** Fleming, 1828; ***Morhua barbata,*** Fleming, 1828; ***Gadus colias*** Gronow, 1854; ***Gadulus luscus,*** Malm, 1877.

FAO Names : **En** - Pouting; **Fr** - Tacaud commun; **Sp** - Faneca.



(after Quero, 1984)

Fig. 148

Diagnostic Features : Lower jaw shorter than upper. Greatest body depth greater than head length. **Colour:** light brown dorsally, sides greyish becoming silvery ventrally; four or five broad indistinct tranverse bars on the side; a dark blotch at the upper edge of the pectoral base.

Geographical Distribution : From the British Isles and Skagerrak to about 25°N along the West African coast, also at the offshore islands and in the western Mediterranean (Fig. 149).

Habitat and Biology : A benthopelagic species living mostly on the outer shelf up to 100 m depth, but moving inshore to depths of 50 m or less for spawning. Found also in estuaries. Immatures form schools above sandy bottoms. First maturity is reached at the end of first year. Spawning occurs from December to April (mostly March-April) in the Atlantic and from January to July in the Mediterranean. Growth is rapid: at 1 year, 21-25 cm; 2 years, 23-27 cm; 3 years, 28-33 cm. Maximum age is 4 years. Feeds on benthic crustaceans but also on small fish, molluscs and polychaetes.

Size : Reaches at most 45 cm total length, generally 30 cm or less.

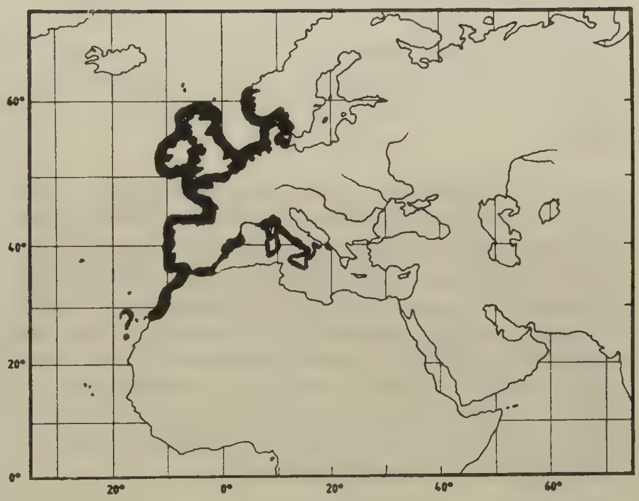


Fig. 149

Interest to Fisheries : The catch reported for 1987 in the FAO Yearbook of Fishery Statistcs was 22 664 metric tons of which 18 591 t were taken in the northeastern Atlantic (France: ca. 6 400 t; Spain: ca. 6 100 t; Portugal: ca. 4 300 t; and others), 2 006 t in the eastern central Atlantic (mostly Morocco) and 2 067 t in the Mediterranean (mostly Spain).

Local Names : BELGIUM: Steenbolk; DENMARK: Skaegtorsk; FRANCE: Barraud, Gade, Guitan moulek, Guidon, Kiankiarquia, Officier, Plouse, Poule de mer, Tacaud; GERMANY: Franzosendorsch; GREECE: Bakallaraki: ITALY: Merluzzetto bruno; MOROCCO: Capela, Faneca; NETHERLANDS: Steenbolk; NORWAY: Skjeggtorsk; PORTUGAL: Faneca; SPAIN: Faneca; SWEDEN: Bredtorsk, Skaggtorsk; UK: Bib, Pout, Pouting; USSR: Lyusca.

Literature : Svetovidov (1948); Bini (1969); Quero (1984); Fischer, Bauchot & Schneider, eds (1987).

Trisopterus minutus (Linnaeus, 1758)

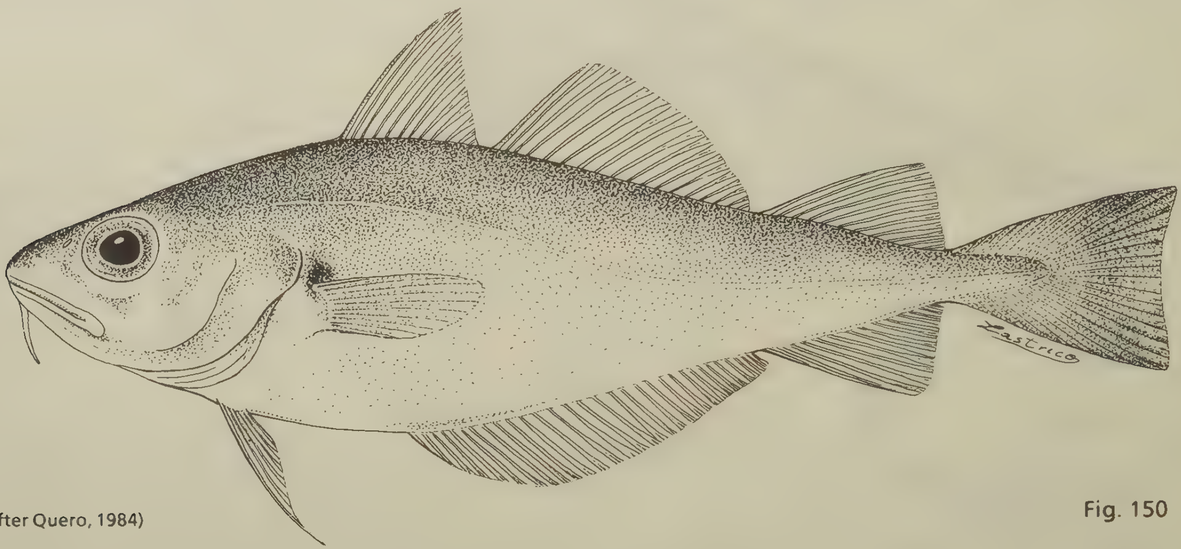
Fig. 150

GADI Triso 1

Scientific Name with Reference : ***Gadus minutus*** Linnaeus, 1758, Syst.Nat., ed. 10:253.

Synonyms : ***Gadus capelanus*** Lacépède, 1800; ***Gadus tacaud*** Lacépède, 1800; ***Morva capelanus,*** Risso, 1826; ***Brachygadus minutus,*** Gill, 1863; ***Gadulus minutus,*** Malm, 1877; ***Trisopterus minutus minutus,*** Svetovidov, 1948; ***Trisopterus minutus capelanus,*** Svetovidov, 1948; ***Gadus (Trisopterus) capelanus,*** Dieuzeide et al., 1959.

FAO Names : En - Poor cod; **Fr** - Capelan de Méditerranée; **Sp** - Capellán.



(after Quero, 1984)

Fig. 150

Diagnostic Features : Lower jaw shorter than upper. Greatest body depth equal to or less than head length. **Colour:** brownish yellow dorsally, paler ventrally; a dark blotch at upper base of pectoral fin.

Geographical Distribution : From the Trondheim Fjord and the Faeroe Islands to Portugal and along the Atlantic coast of Morocco and in the Mediterranean (Fig. 151).

Habitat and Biology : Benthopelagic to depths of 400 m, mostly from 15 to 200 m in the Atlantic and to 120 m in the Mediterranean on muddy or sandy bottoms. A gregarious species, living in small schools. First maturity is reached at 1 year. Spawns from December to March off Spain, February to March in the English Channel and December to March in the Mediterranean, at 50-100 m depth. Growth is rapid, more so in females than in males: at 1 year, 12-14 cm; 2 years, 17-19 cm; at 4 years, 40 cm for males and 6 years for females. Feeds on crustaceans, small fish, and polychaetes.

Size : Reaches 40 cm total length.

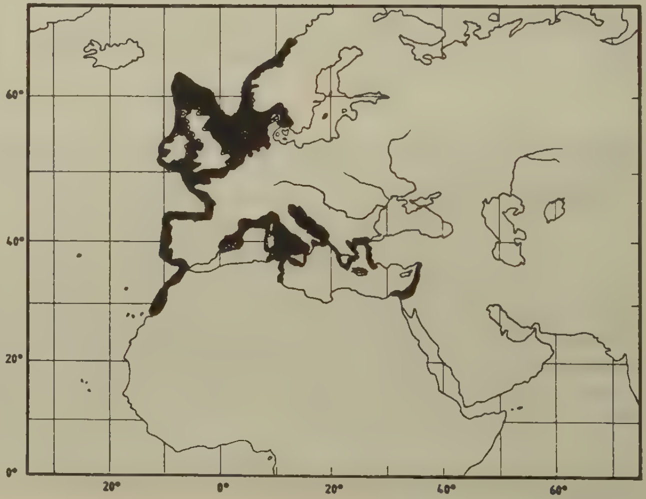


Fig. 151

Interest to Fisheries : Locally abundant and reputedly a good food fish but not extensively fished. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics was 935 metric tons, all by France in the Mediterranean. Gear used includes trawls, gill nets, longlines and handlines. Found regularly in northern Mediterranean markets, fresh and chilled; also used for fish meal in Sicily.

Local Names : ALBANIA: Peshk lakuriq; ALGERIA: Bakalá; CYPRUS: Bacaliarakí; EGYPT: Nazelli; FRANCE: Capailla, Capelin; GREECE: Fíghi; ISRAEL: Shibbut guz; ITALY: Asinello, Busbano, Cappellano, Figarotto, Merluzzetto, Mormoro, Pesce mudo; LEBANON: Armout; LIBYA: Merlutso; MALTA: Mankana; MONACO: Capelan; MOROCCO: Capelan; SPAIN: Capella, Mollera; TUNISIA: Nazalli; UK: Poor-cod; USSR: Kapelan; YUGOSLAVIA: Ugotica mala.

Literature : Svetovidov (1948); Bini (1969); Quero (1984) Bauchot, Fischer & Schneider, eds (1987).

Remarks : The population living in the Mediterranean and to the south along the African coast is considered to be a separate species or subspecies, *T. minutus capelanus*.

Urophycis

GADI Uroph

Genus with Reference : *Urophycis* Gill, 1864, Proc.Acad.Nat.Sci.Philad., 1863 (1864), 15:240.

Diagnostic Features : Two dorsal fins; one anal fin, neither connected with caudal fin; first dorsal fin with 9 to 13 rays; anal fin not indented; pelvic fin with two elongated rays. Head with lateral- line pores. Opisthotic bone at rear of skull lacking large processes for attachment of pectoral girdle; post-temporal and supracleithrum poorly developed.

Habitat, Distribution and Biology : Benthic, mostly on soft bottom, chiefly in the western Atlantic from Canada to Argentina, rarely caught in the eastern North Atlantic.

Interest to Fisheries : Several of the species are fished commercially and are of varying importance.

Remarks : The taxonomy of *Urophycis* species requires additional study, especially in the tropics and off temperate South America. Species accounts are not presented for indeterminate names, which are also excluded from keys and synonymies.

Key to species:

1a. First dorsal fin with an elongated ray

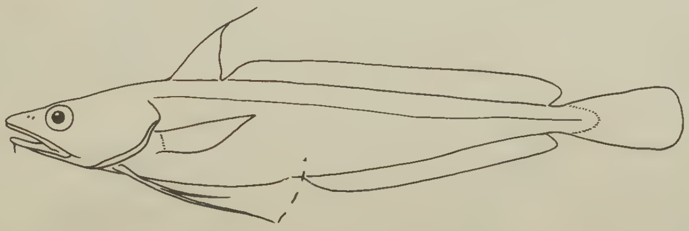
  2a. Upper limb of first gill arch with two rakers (rarely 3); scale rows between first dorsal fin and lateral line 11 or more

    3a. Pelvic fin rarely reaching beyond origin of anal fin (Fig 152) .... ***U. tenuis***

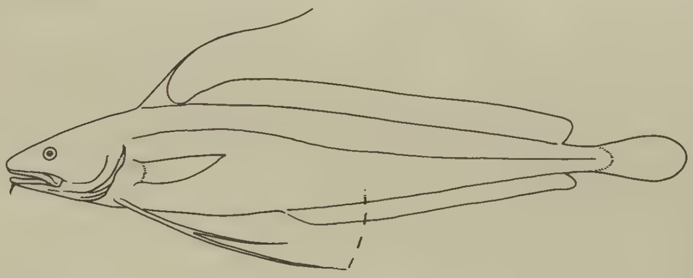
    3b. Pelvic fin extending beyond origin of anal fin (Fig. 153) .. ***U. brasiliensis***

  2b. Upper limb of first gill arch with 3 rakers (rarely 2); scale rows between first dorsal fin and lateral line about 7 (Fig. 154) .... ***U. chuss***

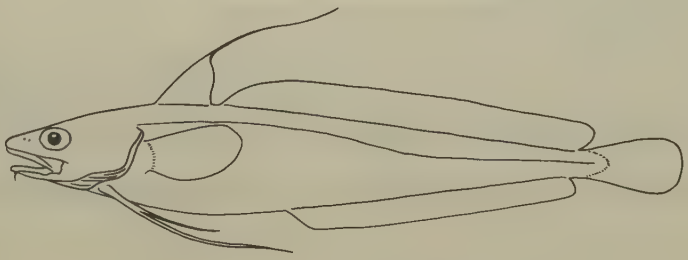
1b. First dorsal without an elongated ray



U. tenuis Fig. 152



U. brasiliensis Fig. 153



U. chuss Fig. 154

4a. Scale rows between first dorsal fin and lateral line 18 to 21 (Fig. 155) ...... ***U. earllii***

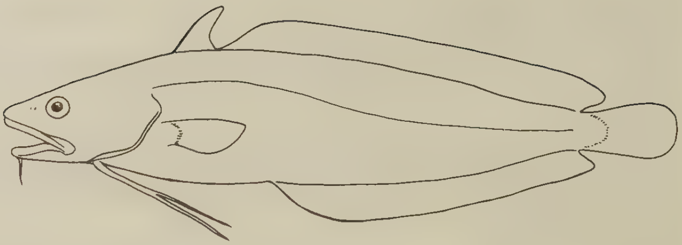
4b. Scale rows between first dorsal fin and lateral line 12 or fewer

- **5a.** Upper limb of first gill arch with 2 rakers (Fig. 156) .... ***U. floridana***

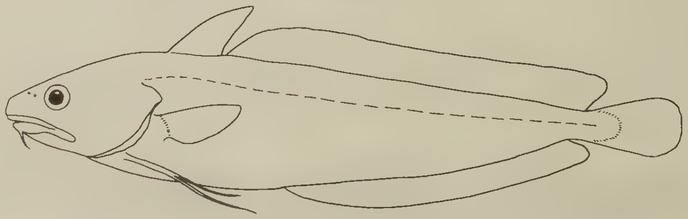
- **5b.** Upper limb of first gill arch with 3 rakers (rarely 2)

  - **6a.** A series of dark spots on head; first dorsal fin with a dark blotch and distinct white margin (Fig. 157) .... ***U. regia***

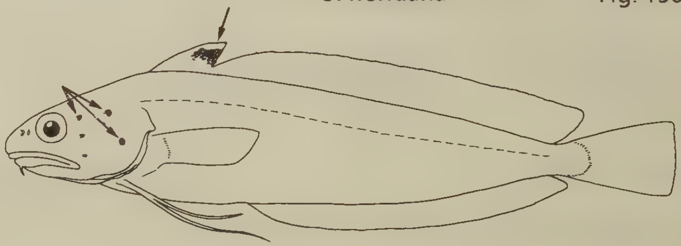
  - **6b.** No series of dark spots on head; first dorsal fin with neither a dark blotch nor white margin (Fig. 158) .... ***U. cirrata***



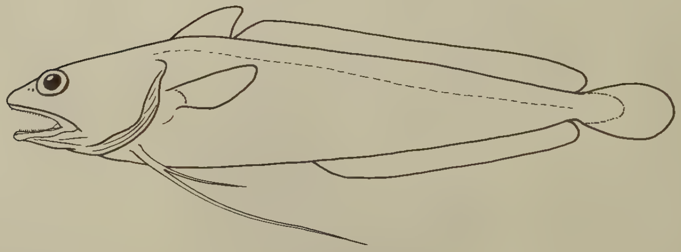
U. earllii Fig. 155



U. floridana Fig. 156



U. regia Fig. 157



U. cirrata Fig. 158

Urophycis brasiliensis (Kaup, 1858)

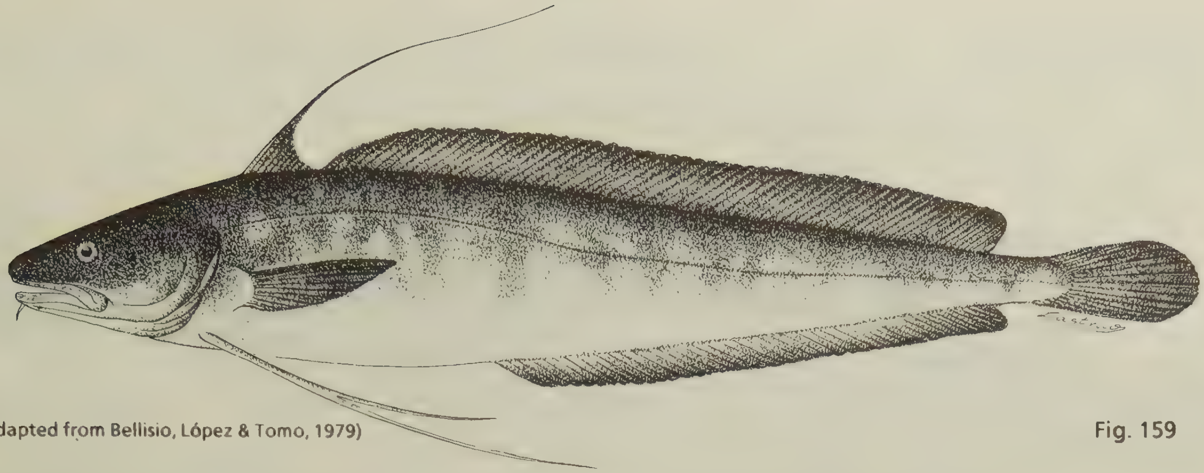
Fig. 159

GADI Uroph 3

Scientific Name with Reference : ***Phycis brasiliensis*** Kaup, 1858, Wiegm.Arch., 88.

Synonyms : ***Laemonema longifilis*** Günther, 1880.

FAO Names : **En** - Brazilian codling; **Fr** - Phycis brésilien; **Sp** - Brótola brasileña.



(adapted from Bellisio, López & Tomo, 1979)

Fig. 159

Diagnostic Features : Upper limb of first gill arch with two rakers. First dorsal fin with an elongated ray; pelvic fin extending beyond origin of anal fin. Scale rows between first dorsal fin and lateral line about 13. **Colour:** a dusky blotch present on opercle.

Geographical Distribution : Coasts of southern Brazil, Uruguay, and Argentina (Fig. 160).

Habitat and Biology : Demersal, taken at depths of 70 to 80 m off Argentina.

Size : Reaches to at least 40 cm total length.

Interest to Fisheries : A prized species taken incidentally by corvina fishermen. The catch reported for 1987 in the FAO Yearbook of Fishery Statistics totalled 1 266 metric tons, of which 1 202 t were taken by Argentina.

Local Names : ARGENTINA: Brótola; BRAZIL: Abrotea; URUGUAY: Brótola.

Literature : Svetovidov (1948); Bellisio, López & Tomo (1979).

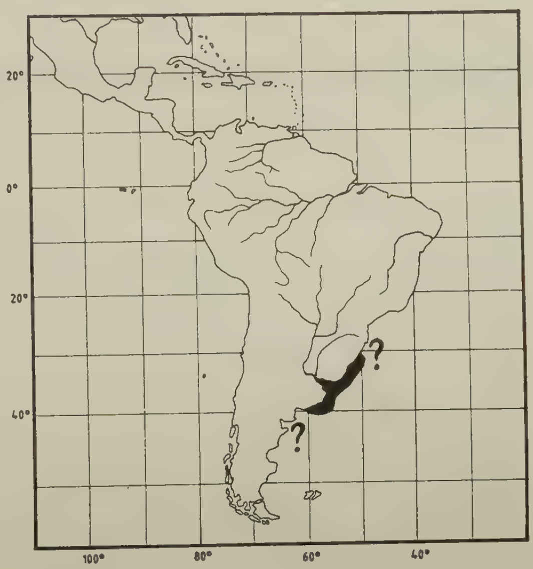


Fig. 160

Urophycis chuss (Walbaum, 1792)

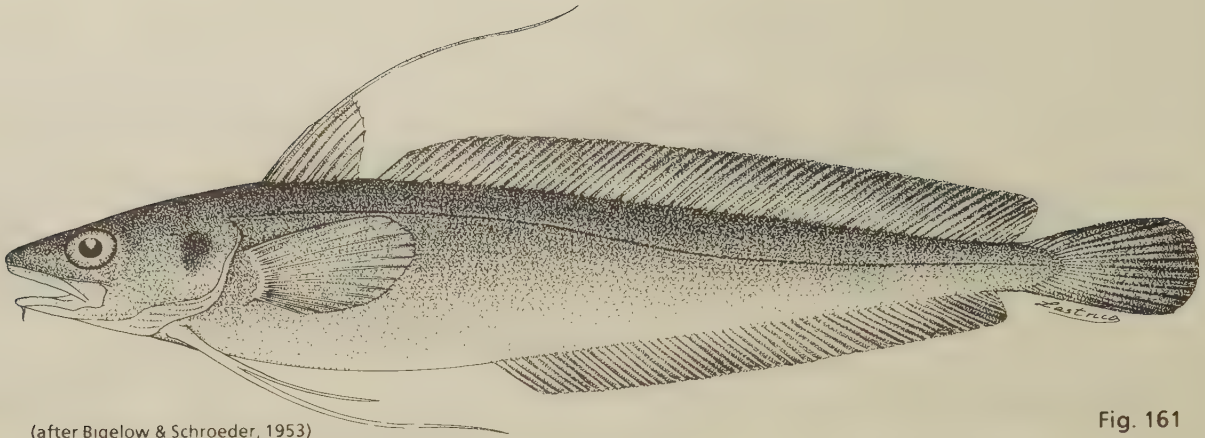
Fig. 161

GADI Uroph 4

Scientific Name with Reference : ***Blennius chuss*** Walbaum, in Artedi, 1792, Gen.Pisc.; 186.

Synonyms : ***Enchelyopus americanus*** Bloch & Schneider, 1801; ***Gadus longipes*** Mitchill, 1814; ***Phycis marginatus*** Rafinesque, 1818; ***Phycis filamentosus*** Storer, 1858; ***Phycis americanus,*** Günther, 1862; ***Phycis chuss,*** Gill, 1864.

FAO Names : En - Red hake; **Fr** - Merluche écureuil; **Sp** - Locha roja.



(after Bigelow & Schroeder, 1953)

Fig. 161

Diagnostic Features : Upper limb of first gill arch with 3 rakers (rarely 2). First dorsal fin with an elongated ray. Scale rows between first dorsal fin and lateral line about 7. **Colour:** variable, reddish to olive brown dorsally, sometimes very dark or mottled; lower side paler, sometimes with dusky dots; belly and underside of head pale; fins generally dark, except for pelvics, which are pale; a dusky blotch present on opercle.

Geographical Distribution : Western North Atlantic, from North Carolina to southern Nova Scotia, straying to the Gulf of St. Lawrence. Rare European records are probably *U. tenuis* (Fig. 162).

Habitat and Biology : Normally found on soft muddy and sandy bottoms, but never on rocks gravel or shells. Juveniles live along the coasts at shallow depths (4 to 6 m); adults migrate to deeper waters, beyond 35 m, generally to between 110 and 130 m, and in some instances , to over 550 m. The highest concentrations of mature fish are found deeper than 180 m. There are apparently no long-distance migrations, but only seasonal inshore-offshore movements. Juveniles live in scallops (*Placopecten magellanicus*), then in the vicinity of scallop beds until their second year of life. Maturity is reached at 3 years. At the beginning of summer (commencing in spring and continuing into the autumn) the fish move from deep to shallow waters for spawning, then again offshore until the following spring. The main spawning grounds are located off southern New England and all around inshore areas of the Gulf of Maine in depths of less than 100 m. Growth is very rapid and females are larger than males: at 1 year, 20 cm; 2 years, 32 cm; 3 years, 40 cm. Feeds on shrimps, amphipods and other crustaceans, but also on squid and fish (herring, flatfish, mackerel and others).

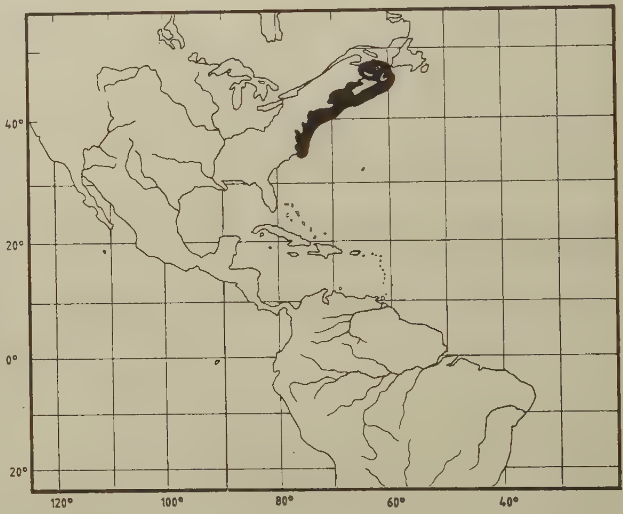


Fig. 162

Size : Reaches 50 cm total length (records of larger fish are probably *U. tenuis*).

Interest to Fisheries : A variable constituent of the trawl fishery. Catches have decreased from 75 500 metric tons in 1972 to 2 626 t in 1987, mostly by USA (2 009 t) in Gulf of Maine. Marketed fresh or frozen; smaller fish are used for animal feeds.

Local Names : CANADA: Red hake, Squirrel hake; UK: Squirrel hake; USA: Red hake, Squirrel hake.

Literature : Svetovidov (1948); Bigelow & Schroeder (1953); Leim & Scott (1966); Musick (1973, 1974).

Remarks : Musick (1973) has shown that *U. chuss* and *U. tenuis* have been confused for many years. Hence many of the earlier synonymies, literature accounts and catch statistics are incorrect.

Urophycis cirrata (Goode & Bean, 1896)

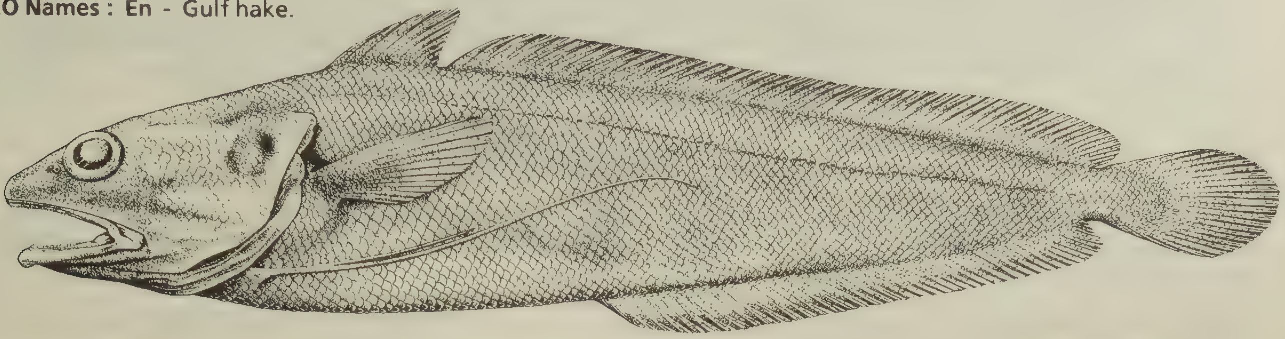
Fig. 163

GADI Uroph 5

Scientific Name with Reference : ***Phycis cirratus*** Goode & Bean, 1896, Oceanic Ichthyol., 1896;358.

Synonyms : None

FAO Names : En - Gulf hake.



(drawn by K. Moore, Washington)

Fig. 163

Diagnostic Features : Gill rakers on upper arm of first arch 3 (rarely 2); barbel very short, lacking in many specimens. First dorsal fin lacking an elongated ray. Scale rows between lateral line and first dorsal fin 6 to 9. **Colour:** a diffuse dusky blotch present on opercle; no series of dark spots on head.

Geographical Distribution : Florida, Gulf of Mexico, northern coasts of South America to the Orinoco, perhaps to Rio de Janeiro (Fig. 164).

Habitat and Biology : Demersal on mud bottoms from 27 to 684 m, most common between 360 and 470 m.

Size : Reaches at least 57 cm total length.

Interest to Fisheries : No commercial fishery, perhaps due to a relatively deep centre of abundance.

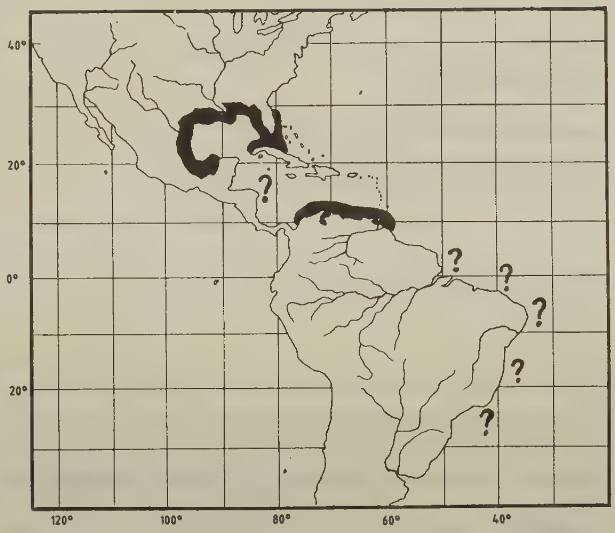


Fig. 164

Urophycis earllii (Bean, 1880)

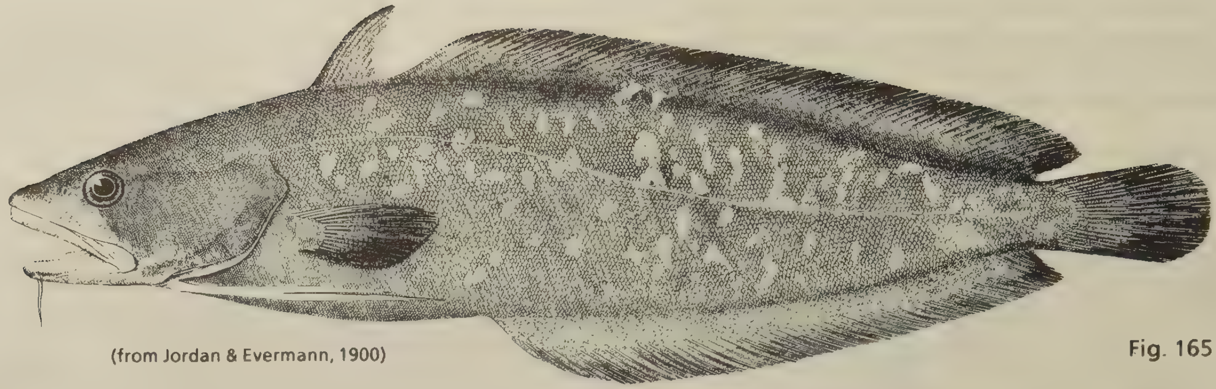
Fig. 165

GADI Uroph 6

Scientific Name with Reference : ***Phycis earllii*** Bean, 1880, Proc.US Natl.Mus., 3:69

Synonyms : None.

FAO Names : En - Carolina hake.



(from Jordan & Evermann, 1900)

Fig. 165

Diagnostic Features : Gill rakers on upper arm of first arch two. First dorsal fin lacking an elongated filament; pelvic fin rarely extending beyond origin of anal fin. Scale rows between lateral line and first dorsal fin 18 to 21. **Colour :** generally dark; sides mottled.

Geographical Distribution : Southeast coast of the USA, from Cape Hatteras to the northeast coast of Florida (Fig. 166).

Habitat and Biology : Demersal from nearshore to about 81 m, apparently prefers hard bottoms.

Size : Reaching about 45 cm total length.

Interest to Fisheries : Taken as bycatch in trawls. No commercial fishery.

Local Names : USA: Carolina hake.

Literature : Hildebrand & Cable (1938).

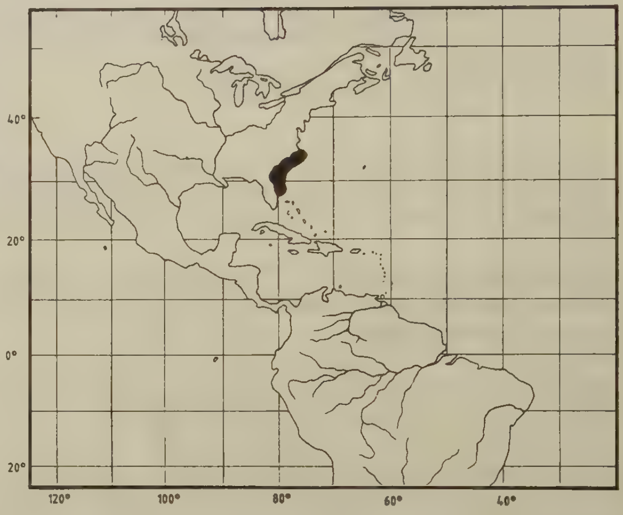


Fig. 166

Urophycis floridana (Bean & Dressel, 1884)

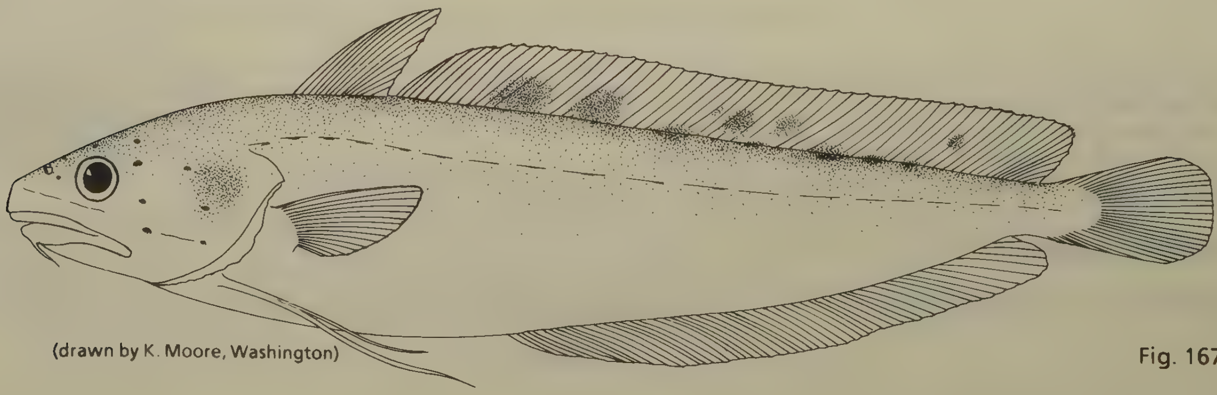
Fig. 167

GADI Uroph 1

Scientific Name with Reference : ***Phycis floridanus*** Bean & Dressel, 1884, Proc.Biol.Soc.Wash.: 100

Synonyms : None

FAO Names : En - Southern codling; **Fr** - Phycis de Floride; **Sp** - Locha de Florida.



(drawn by K. Moore, Washington)

Fig. 167

Diagnostic Features : Gill rakers on upper arm of first arch two. First dorsal fin lacking an elongated ray. Scale rows between first dorsal fin and lateral line 9 to 12. **Colour:** a dusky blotch present on opercle; a series of dark spots on head.

Geographical Distribution : From Beaufort, North Carolina south along the coast and into the Gulf of Mexico, where it occurs south to about 23° lat. off Mexico (Fig. 168).

Habitat and Biology : Onshore to 400 m depth but most common in less than 300 m. Juveniles of this demersal species spend part of their life in estuaries. Shallow-water specimens feed on crustaceans, worms and fish.

Size : Maximum 35 cm; common to 25 cm.

Interest to Fisheries : Fished in coastal waters with bottom trawls; marketed mostly fresh.

Local Names : USA: Southern hake

Literature : Hildebrand & Cable (1938); Cohen (1978).

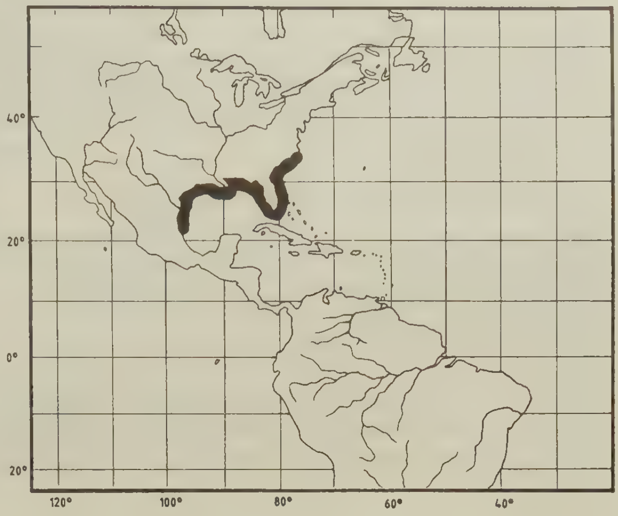


Fig. 168

Urophycis regia (Walbaum, 1792)

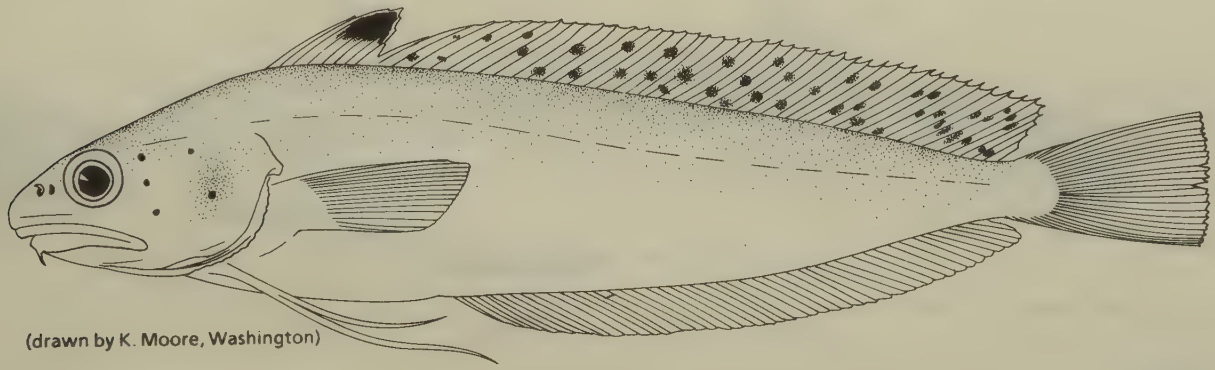
Fig. 169

GADI Uroph 2

Scientific Name with Reference : ***Blennius regius*** Walbaum, 1792, in Artedi, Gen.Pisc., 186.

Synonyms : ***Enchelyopus regalis*** not Bloch & Schneider, 1801; ***Gadus punctatus*** Mitchill, 1815; ***Phycis punctatus,*** Dekay, 1842; ***Phycis regalis,*** Günther, 1862.

FAO Names : En - Spotted codling; **Fr** - Phycis tacheté; **Sp** - Locha regia.



(drawn by K. Moore, Washington)

Fig. 169

Diagnostic Features : Gill rakers on upper arm of first arch 3 (rarely 2). First dorsal fin lacking an elongated ray. Scale rows between first dorsal fin and lateral line 9 to 12. **Colour:** a dusky blotch on opercle; a series of dark spots on head; first dorsal fin with a dark blotch and distinct white margins.

Geographical Distribution : Common from southern New England to the northeast coast of Florida; also found in the northeastern Gulf of Mexico (Fig. 170).

Habitat and Biology : Onshore to 420 m depth, most common between 110 and 185 m. Juveniles of this demersal species spend part of their life in estuaries. Feeds mainly on crustaceans, but fish and squid have also been found in stomachs.

Size : Maximum 41 cm; common to 17 cm.

Interest to Fisheries : Fished in coastal waters with bottom trawls. Marketed fresh in small quantities.

Local Names : USA: Spotted hake.

Literature : Hildebrand & Schroeder (1928); Hildebrand & Cable (1938); Bigelow & Schroeder (1953); Cohen (1978).

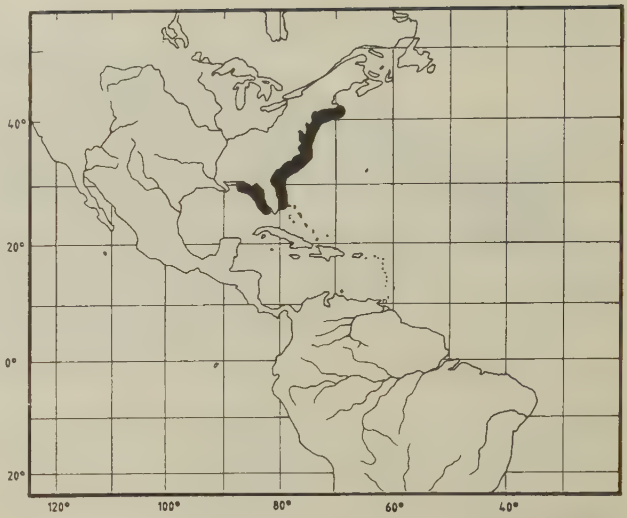


Fig. 170

Urophycis tenuis (Mitchill, 1814)

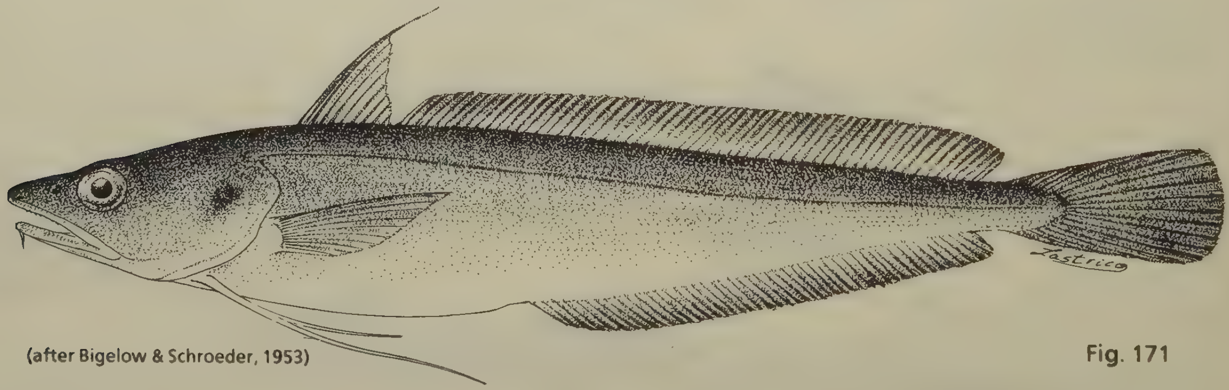
Fig. 171

GADI Uroph 7

Scientific Name with Reference : ***Gadus tenuis*** Mitchill, 1814, Rept. in Part Fishes N.Y.:4.

Synonyms : ***Phycis furcatus*** Fleming, 1828; ***Phycis americanus*** Storer, 1858; ***Phycis dekayi*** Kaup, 1858; ***Phycis tenuis***, Gill, 1864; ***Urophycis (Emphycis) tenuis***, Jordan & Evermanm, 1898; ***Phycis borealis*** Saemundsson, 1913.

FAO Names : **En** - White hake; **Fr** - Merluche blanche; **Sp** - Locha blanca.



(after Bigelow & Schroeder, 1953)

Fig. 171

Diagnostic Features : Upper limb of first gill arch with two rakers (rarely 3). First dorsal fin with an elongated ray. Scale rows between first dorsal fin and lateral line about 12. **Colour :** variable, dorsally various dark shades, paler laterally, sometimes bronze, belly pale dirty to yellow white; pelvic fins pale; a dusky blotch present on opercle.

Geographical Distribution : Labrador and the Grand Banks of Newfoundland to the coast of North Carolina. Straying to Iceland in the east and Florida in the south (Fig. 172).

Habitat and Biology : Demersal on soft, muddy bottoms of the continental shelf and upper slope. Although it reaches down to 980 m depth, it is mostly found at 180 m. Mature fish migrate inshore in the northern Gulf of Maine in summer, disperse in autumn, and move into deepest areas in winter. Spawns from July to September in shallow waters. Males are mature at 40 cm length, females at 48 cm. Fecundity ranges from 1 to 15 million eggs per female (mostly 2 to 6 million). Growth is rapid: at 1 year, 20 cm, 3 years, 42 cm; 4 years, 46 cm; 5 years, 49 cm; 6 years, 55 cm; 7 years, 60 cm. Maximum age is 10 years. Feeds on small crustaceans, squids and small fish.

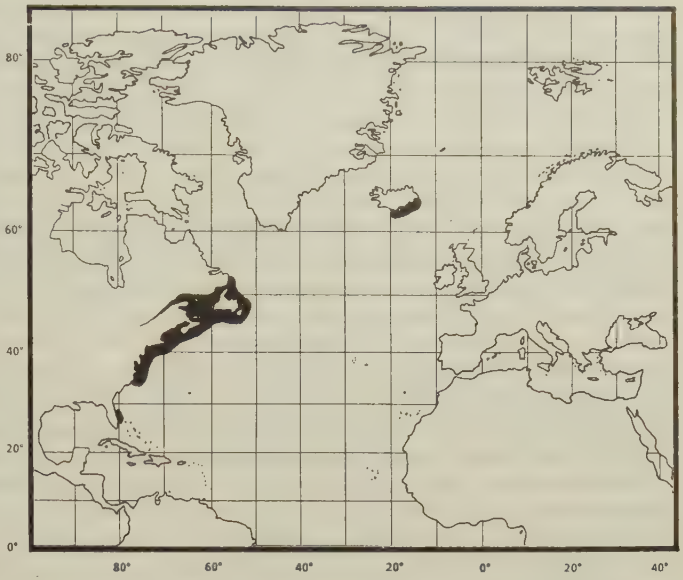


Fig. 172

Size : Reaches about 120 cm total length; common to 70 cm.

Interest to Fisheries : Reported landings in 1987 were 30 429 metric tons, mostly taken by Canada (19 570 t), USA (5 830 t), and Spain (4 788 t). Caught with gill nets, otter trawls, Danish and Scottish seines, longlines and other gear. The major fishing grounds are located at 100 to 247 m depth in Newfoundland and the Gulf of Maine. Larger fish are marketed fresh or frozen as fillets; smaller ones are used for animal feed.

Local Names : CANADA, USA: Mud hake, White hake.

Literature : Bigelow & Schroeder (1953); Musick (1973, 1974); Beacham (1983).

Remarks : Landings of this species have been confused with those of ***U. chuss***.

2.5 FAMILY MACROURIDAE

MACROUR

Synonyms : Coryphaenoididae Gilbert & Hubbs, 1916; Macrouroididae Smith & Radcliffe, 1912.

FAO Names : En - Grenadiers, Rattails, Whiptails; **Fr** - Grenadiers; **Sp** - Colas de ratón, Granaderos, Ratones.

General Features : Trunk short; tail compressed and greatly elongated, tapering to a slender point that lacks a caudal fin (except in ***Trachyrincus*** which has a small caudal fin; other species may develop what appears to be a caudal fin when the tail tip is broken off and the dorsal and anal rays overgrow the broken end). Head small to enormously inflated; shape compressed, rounded, or cylindrical, with a bluntly rounded to sharply pointed snout; mouth large and terminal to small and inferior; chin barbel usually present; eyes moderate to very large in most; teeth on premaxilla and mandible only, none on roof of mouth; arrangement on jaws variable from sparse single series of enlarged canines to broad villiform bands; gillrakers tubercular in most, long and slender in subfamilies Bathygadinae, Macrouroidinae and Trachyrincinae; branchiostegal rays 6 or 7 (rarely 8). Dorsal fins two, except in Macrouroidinae with one; first dorsal high, the two anteriormost rays spinous except in Trachyrincinae and Macrouroidinae; first spinous ray minute and closely appressed to base of long stiff second ray; second dorsal and anal fins long, usually with more than 80 rays, both fins meet at tip of tail; pectoral fins narrow-based, positioned high on trunk; pelvic fins narrow-based, thoracic to almost jugular in position, with 5 to 17 rays (fin absent in ***Macrouroides***). Anus closer to pelvic fins than to anal fin in some species; a light organ present on ventral midline of trunk in some species. Scales cycloid, but exposed field of each scale often covered with sharp spinules sometimes arranged in ridgelike rows; a stout terminal, scutelike scale at tip of snout in some species; ridgelike rows of coarse, scutelike scales on head of some species. A well developed swimbladder in all but the bathypelagic species (lost or rudimentary); retia and gas glands usually 2 to 6 (to as many as 11 in a few species).

Habitat, Distribution and Biology : This is a large, diverse family of about 300 species of primarily benthopelagic deep-sea fishes; a few species are bathypelagic. Grenadiers occupy all oceans, except the high Arctic, and almost all basins with deep oceanic connections;. none normally occur in depths shallower than about 100 m, but many are found at abyssal depths, one species to more than 6 000 m; most species are found between 200 m and 2 000 m. In the Pacific, members of the family apparently compose the greatest vertebrate biomass at depths of 2 000 to 6 000 m. Their size ranges from about 25 cm to more than 1.5 m..

Marshall (1973) provides a thorough summary of much of what is known about the anatomy and biology of the group. Gordon (1979) adds to this with interesting views of their life style and phenology in relation to age, growth, reproduction and feeding Little is known about the reproduction, early life history, and biology of even the most common species. Marshall (1973) suggests that eggs are spawned near the bottom but float slowly surfaceward; the newly hatched larvae live near the seasonal thermocline; the older and metamorphosing individuals live deeper and closer to the bottom. Food of these fishes is highly variable depending on the species and life stage and consists of a wide range of fish and both benthic and pelagic invertebrates. Bathypelagic larvae are known to gorge themselves on pelagic copepods. In some species, the young feed primarily on small benthic invertebrates whereas the adults feed on larger pelagic organisms such as decapod crustaceans, fish, and cephalopods.

Interest to Fisheries : Except for four species, the present economic importance of most grenadiers is minimal, although many species are taken by commercial bottom trawlers as bycatch and used either fresh or processed, for fishmeal and fish paste. The roundnose grenadier (***Coryphaenoides rupestris***) has been the source of an important fishery in the North Atlantic for the past two decades. Three species of ***Macrourus*** (***M. berglax*** in the North Atlantic and ***M. carinatus*** and ***M. holotrachys*** in the South Atlantic) are also commercially targeted. The giant grenadier (***Albatrossia pectoralis***) of the North Pacific was the source for a large Soviet trawl fishery in the Okhotsk and Bering seas in the sixties; but after a period of reduced effort, the catch has increased in recent years.. The Pacific grenadier (***Coryphaenoides acrolepis***) is taken in small quantities by a few vessels off California and sold as fillets in the fresh-fish market. Numerous species taken off Japan are used for fish paste. Catch statistics are not available for grenadiers in most countries so their use is generally unknown.

The total catch of Macrouridae reported to FAO for 1987 amounted to 51 226 metric tons, of which 20 846 t corresponded to ***Coryphaenoides rupestris*** in the western and eastern North Atlantic and 30 380 t to other species in the southwestern Atlantic (mostly ***Macrourus***) and in the northwestern Pacific. Furthermore, 33 173 t of unidentified gadiforms were reported for 1987, of which a large proportion probably corresponded to macrourids.

The statistical data for the past decade show a decreasing trend for the catches of ***Coryphaenoides rupestris*** in the western North Atlantic, (in excess of 100 000 t in 1975) while the catches of ***Macrourus*** in the southwestern Atlantic are rapidly increasing.

Remarks : The arrangement of this family follows Marshall (1973) and Iwamoto (1989), although it is recognized that other classifications, particularly that of Howes (1988, 1889), may be found to more truly reflect phylogenetic relationships. Evidence for the removal of bathygadines from the suborder Macrouroidea is strong, and supportive of long-held ideas that this group of rattails is quite different from others generally included in the Macrouridae. Each of the remaining three subfamilies have also been treated as distinct families, but for now, it is convenient to treat them in a traditional manner, as they appear more closely related to each other than to any other gadiform group.

The individual treatment of genera and species is spotty, although all genera are included in appropriate keys in the subfamily descriptions, and a figure of a representative of each genus is provided. The decision to include an account of a genus or species was based on its current or potential interest to the fishing industry. This effectively eliminated the abyssal and bathypelagic grenadiers, and those species that are very small (e.g., ***Hymenocephalus***) or are known only from few captures.

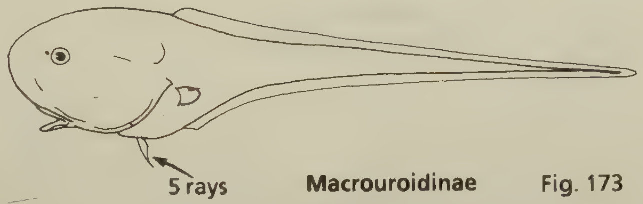
Because taxonomic information on genera and species were based on sometimes incomplete or inadequate descriptions or illustrations from the literature, part of the keys and diagnoses presented in the catalogue should be considered as tentative. Some features used in keys (e.g. posterior extent of upper jaw and naked areas on head in ***Coryphaenoides***) may prove inadequate or insufficient to separate some species with certainty. In general, the keys are not designed for identifying juveniles which often differ from adults in some key characters. Furthermore, when using the keys, it should be understood that they are usually based on near-average counts or measurements applicable to about 80 to 90% of the population, but do not necessarily account for possible individual variations not yet studied due to inavailability of enough material. In the case of couplets of keys using a combination of characters rather than a single feature, the user should make sure that all of them agree with the specimen examined (because of possible overlapping in range of individual characters).

Characters given in Distinguishing Features sections may not always be comparable because data were gathered from many different sources. To aid comparisons, an attempt was made to keep descriptions as closely parallel as possible within each genus treated. Although the descriptions have been gleaned heavily from the literature, much of the data are supplemented from my own examination of specimens.

Key to Subfamilies

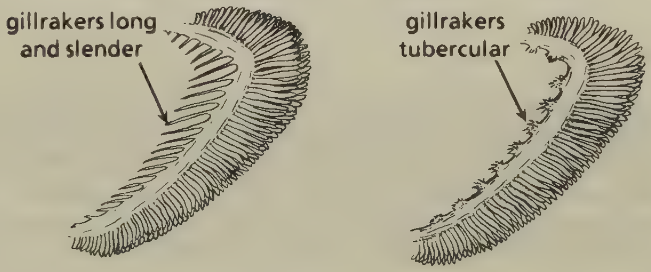
1a. One continuous dorsal fin, anterior portion not elevated; pelvic fins absent or small, with 5 rays. Head massive, soft, greatly inflated (Fig. 173) ....**Macrouroidinae**

1b. Two dorsal fins, the first elevated; pelvics with 6 to 17 rays. Head shape variable



Macrouroidinae **Fig. 173**

  2a. Second dorsal fin better developed than anal fin and starting close behind first dorsal (Figs 175,176). Outer gill rakers on first arch slender, lathlike, not tubercular (Fig. 174a). Outer gill slit not restricted by folds of skin connecting upper and lower extent of first gill arch with operculum

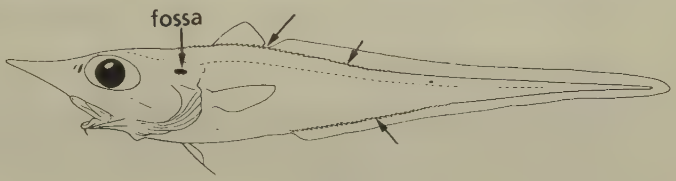


a. Trachyrincinae Bathygadinae

b. Macrourinae

First gill arch **Fig. 174**

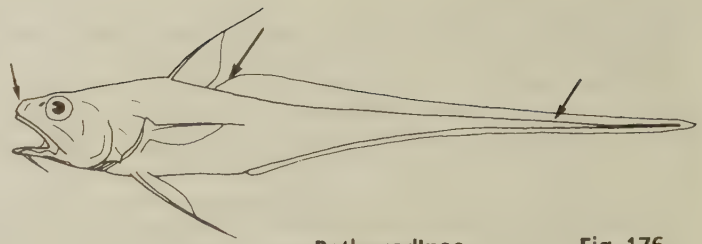
    3a. Snout long, pointed; mouth inferior; body scales spinous, with rows of enlarged scutes along dorsal and anal fins. A post-temporal fossa present (Fig. 175) ....**Trachyrincinae**



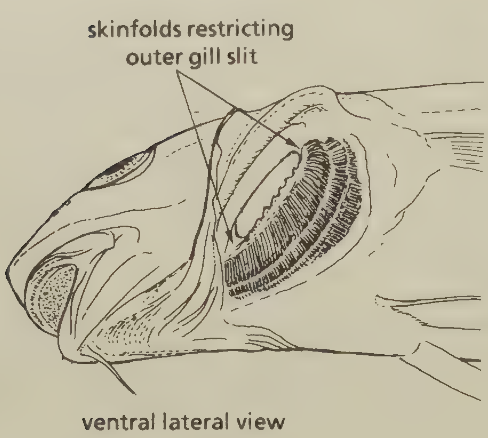
Trachyrincinae **Fig. 175**

3b. Snout rounded; mouth terminal; body scales unmodified, without spinules. No post-temporal fossa (Fig.176) ....**Bathygadinae**

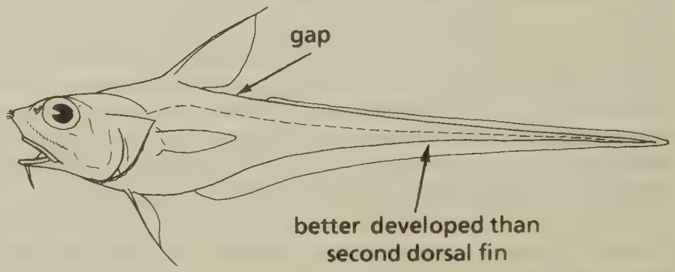
2b. Anal fin better developed than second dorsal; a distinct gap between dorsal fins (Fig. 178). Gill rakers all tubercular (rarely lappet-like) (Fig. 174b). Outer gill slit restricted by folds of skin (Fig 177) ....**Macrourinae**



Bathygadinae **Fig. 176**
(after Parr, 1946)



Macrourinae Fig. 177
(after Iwamoto, 1970)



Macrourinae Fig. 178

2.5.1 Subfamily BATHYGADINAE

Synonyms : None

General Features : Mouth wide, terminal, slightly protractile, premaxillae with short pedicels; small to minute teeth in bands in both jaws; barbel long, reduced, or absent; branchiostegal rays 7; first gill slit unrestricted; gillrakers on first arch long, slender, numerous. Two dorsal fins, the first short, with a slender spinous second ray, the second long, beginning close behind the first, with rays well developed, much better so than those of anal fin, which has rudimentary rays. Abdominal vertebrae 11 to 13. Scales without spinules. Swimbladder with 2 or 4 retia mirabilia; no drumming muscles. Anus immediately before anal fin. No light organs.

Habitat, Distribution and Biology : Worldwide in tropical to subtropical seas, but absent in continental slope waters of the eastern Pacific. Species of this subfamily span a considerable depth range, from about 200 m to more than 2 700 m (***Bathygadus favosus***), but most are found between 400 and 1 500 m. Their large terminal mouth with small teeth in bands, numerous slender gill rakers, simple N- or S-shaped intestines, and fin structure suggest a feeding mode somewhat different from most other grenadiers. Stomach contents most often show copepods, euphausiids, and natantian decapod crustaceans, suggesting a preference for free-swimming, off-bottom prey.

Size : To more than 60 cm.

Interest to Fisheries : Only ***Bathygadus macrops*** of the North Atlantic appears to occur in sufficient numbers and in shallow enough depths to be of interest to fisheries. A deeper-living species with a similar geographic distribution, ***B. melanobranchus***, is also taken in moderate quantities by deep trawlers.

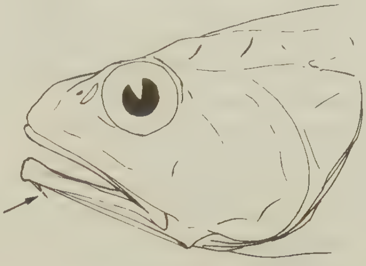
Literature : Okamura (1970a); Marshall (1973).

Remarks : Okamura (1970a) and Marshall (1973) have more than adequately characterized this well-marked group of species. The included genera, **Bathygadus** and **Gadomus**, are closely related, but the species appear to fall in nicely with one or the other. Howes (1988, 1989) has removed the group from the suborder Macrouroidei and placed it in the Gadoidei. The present author does not feel that the evidence for such a drastic move is sufficiently compelling to fully support it as yet. It seems wiser to reserve judgement until additional evidence emerges.

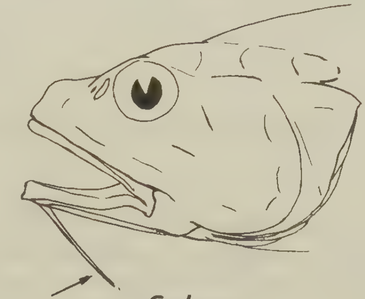
Key to Genera :

1a. Barbel small (less than 1/3 of orbit) or absent (Fig. 179). Teeth small, but never shagreen-like. Two retia mirabilia in swimbladder .... ***Bathygadus***

1b. Barbel long (except in ***G. capensis***), usually more than half of orbit diameter (Fig. 180). Teeth small to minute, often shagreen-like. Four retia in swimbladder .... ***Gadomus***



Bathygadus **Fig. 179**



Gadomus **Fig. 180**

Bathygadus Günther, 1878

MACROUR Bath

Genus with Reference : ***Bathygadus*** Günther, 1878, Ann.Mag.Nat.Hist., ser. 5, 2:23 (type species ***Bathygadus cottoides*** Günther, 1878 by monotypy).

Synonyms : ***Melanobranchus*** Regan, 1903; ***Regania*** Jordan & Starks, 1904.

Diagnostic Features : Interopercle slender, angulate, shaped somewhat like a boomerang, the posterior third directed posteroventrally, the ventral margin concave; olfactory bulbs in contact with forebrain. Chin barbel small or absent. First dorsal and pectoral fins seldom with elongated rays; outer pelvic ray sometimes weakly produced. Retia mirabilia in swimbladder 2.

Habitat, Distribution and Biology : Worldwide in tropical to subtropical waters, but not yet reported from the continental slopes of the eastern Pacific. Benthopelagic in about 200 to 1 500 m depth.

Size : To about 52 cm total length.

Interest to Fisheries : So far only 2 species, ***Bathygadus macrops*** and ***B. melanobranchus*** are known to be taken incidentally as bycatch of other fisheries.

Literature : Gilbert & Hubbs (1916; 1920); Iwamoto (1970); Okamura (1970a); Marshall (1973)

Remarks : ***Bathygadus filamentosus*** has a greatly elongated ray in the first dorsal, pectoral, and pelvic fins, very reminiscent of the fins in ***Gadomus longifilis*** and ***G. multifilis***. The absence of a chin barbel and the boomerang-shaped interopercle, however, place the species in ***Bathygadus***. Gilbert & Hubbs (1920:379) provide a key to the 14 species of the genus.

List of Species :

Bathygadus antrodes (Jordan & Gilbert, 1904)
Bathygadus bowersi (Gilbert, 1905)
Bathygadus cottoides Günther, 1878
Bathygadus entomelas Gilbert & Hubbs, 1920
Bathygadus favosus Goode & Bean, 1886
Bathygadus filamentosus (Smith & Radcliffe, 1912)
Bathygadus furvescens Alcock, 1894
Bathygadus garretti Gilbert & Hubbs, 1916
Bathygadus macrops Goode & Bean, 1885
Bathygadus melanobranchus Vaillant, 1888
Bathygadus micronemus (Gilbert, 1905)
Bathygadus nipponicus (Jordan & Gilbert, 1904)
Bathygadus spongiceps Gilbert & Hubbs, 1920
Bathygadus sulcatus (Smith & Radcliffe, 1912)

Bathygadus macrops Goode & Bean, 1885

Fig. 181

MACROUR Bath 1

Scientific Name with Reference : ***Bathygadus macrops*** Goode & Bean, 1885, Proc.U.S.Natl.Mus., 8:598 (northern Gulf of Mexico, 28°34'N, 86°48'W; 613 m).

Synonyms : ***Bathygadus goethemi*** Poll, 1953.

FAO Names : En - Bullseye grenadier.

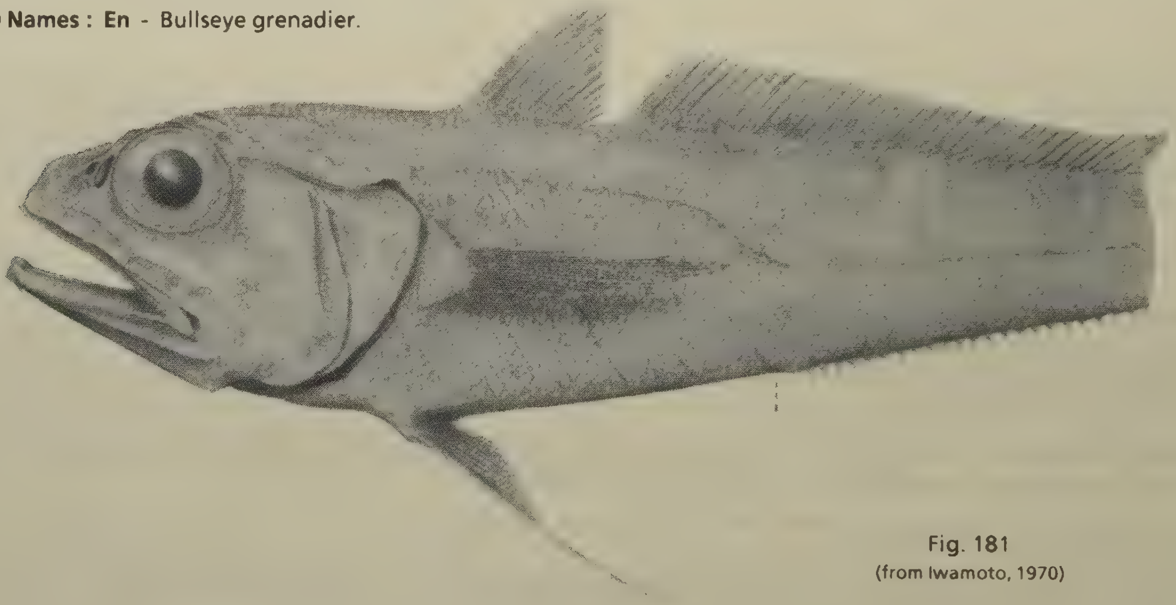


Fig. 181
(from Iwamoto, 1970)

Diagnostic Features : Chin barbel rudimentary; orbits large, 26 to 34% of head length, wider than interorbital space, which is 18 to 27% of head length; head rather firm, not cavernous; outer gill rakers on first arch 6 or 7 + 19 to 22. Integument thick, scale pockets usually well defined. Pelvic fins with 8 rays, outer ray slightly produced; no other prolonged rays in fins. Pyloric caeca 30 to 40.

Geographical Distribution : Tropical Atlantic. Known from the US coast (ca. 37°N) and in the Gulf of Mexico and Caribbean in the western Atlantic; from the Gulf of Guinea (Ivory Coast to Angola), in the eastern Atlantic (Fig. 182).

Habitat and Biology : Benthopelagic from 200 to 777 m. Recorded depth in the eastern Atlantic about 200 to 733 m, in the western Atlantic 347 to 777 m.

Size : To about 50 cm total length.

Interest to Fisheries : Captured in moderate numbers in the Gulf of Mexico as a bycatch in the royal red shrimp (***Pleoticus robustus***) fishery; also found in moderate quantities in the Gulf of Guinea, but of no commercial significance there.

Literature : Iwamoto (1970); Marshall (1973).

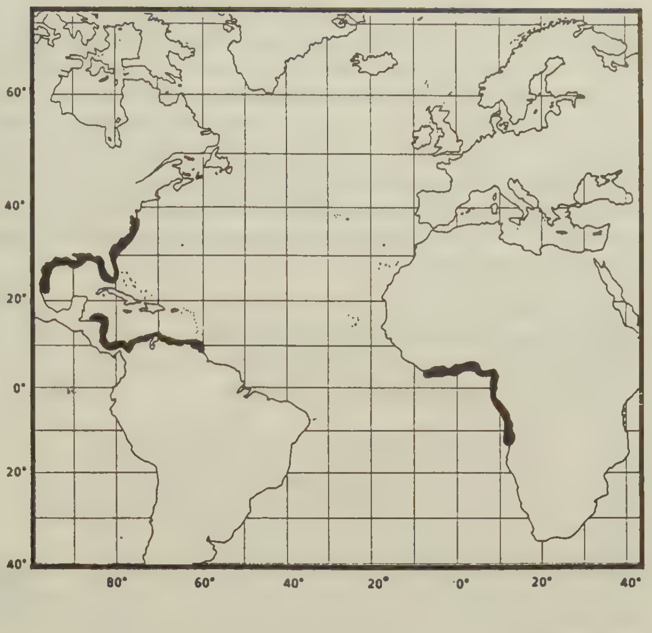


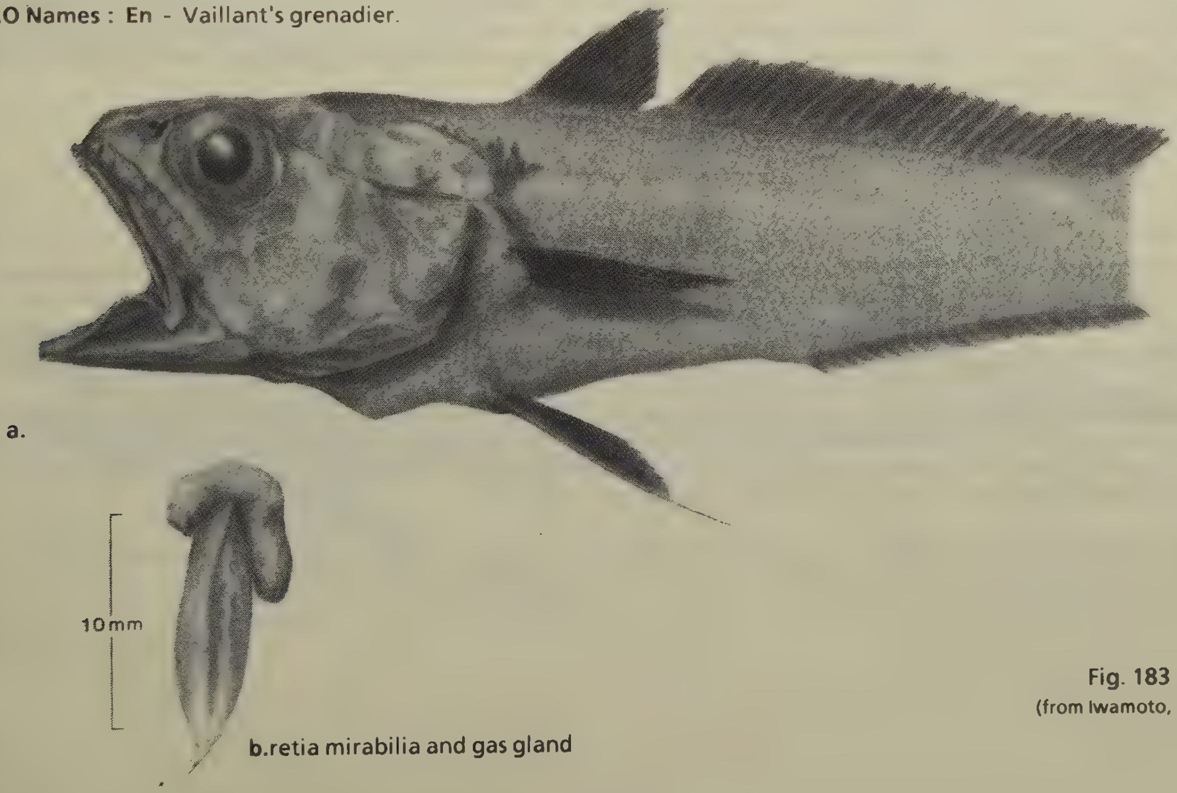
Fig. 182

Bathygadus melanobranchus Vaillant, 1888 Fig. 183 **MACROUR Bath 2**

Scientific Name with Reference : ***Bathygadus melanobranchus*** Vaillant, 1888, Exped.Sci.Travailleur et Talisman, Poissons:206-210, pl. 18, fig. 1 [off Morocco, 32°29'N, 9°47'W; 834 m].

Synonyms : ***Bathygadus vaillanti*** Roule & Angel, 1933.

FAO Names : **En** - Vaillant's grenadier.



b.retia mirabilia and gas gland

Fig. 183
(from Iwamoto, 1970)

Diagnostic Features : Head bones and integument fragile, easily torn; orbits large (25 to 30% of head length); interorbital space about equal to orbit diameter, 25 to 30% of head length; chin barbel absent; outer gillrakers on first arch long and slender, 6 or 7 on upper limb and 21 to 24 on lower limb; outer rakers on second arch tubercular, 2 or 3 on upper limb, 18 to 22 on lower limb; teeth villiform, narrow, in wide bands on upper jaw, in a narrow band on lower jaw. First dorsal fin with two spinous and 9 to 11 segmented rays; pectoral fin with 16 to 20 rays; pelvic fin with 8 rays; outer pelvic ray slightly elongated, but no other fin with prolonged rays. Pyloric caeca 25 to 40, their lengths 1/2 to 4/5 diameter of orbit; swimbladder with two stout retia mirabilia ending in globular, connected gas glands (Fig. 183). **Colour** : overall somewhat swarthy to rather pale; fins dark grey to black; linings of mouth, gill, and abdominal cavities black; gill lamellae each with a darkly pigmented median stripe that gives the gill filaments an overall dusky colour.

Geographical Distribution : Tropical North Atlantic, most of eastern Atlantic (Ireland to South Africa), and possibly into western Indian Ocean (but these records not verified by author) (Fig. 184).

Habitat and Biology : Benthopelagic in about 400 to 1 700 m, but usually taken between 800 and 1 400 m. Merrett and Marshall (1981) found a narrow depth range for the species off North Africa and correspondingly no suggestion of a size-depth relationship. The species was one of the most numerous in their collections and dominated by males. Food items in the stomachs showed a prominence of the mysid ***Gnathophausia zoea***, with pelagic copepods and chaetognaths of somewhat lesser importance.

Size: To about 40 cm total length.

Interest to Fisheries : Captured in small numbers in the Gulf of Mexico with the commercial royal red shrimp (***Pleoticus robustus***), but is not utilized.

Literature : Parr (1946); Grey (1956); Iwamoto (1970); Marshall (1973); Merrett & Marshall (1981).

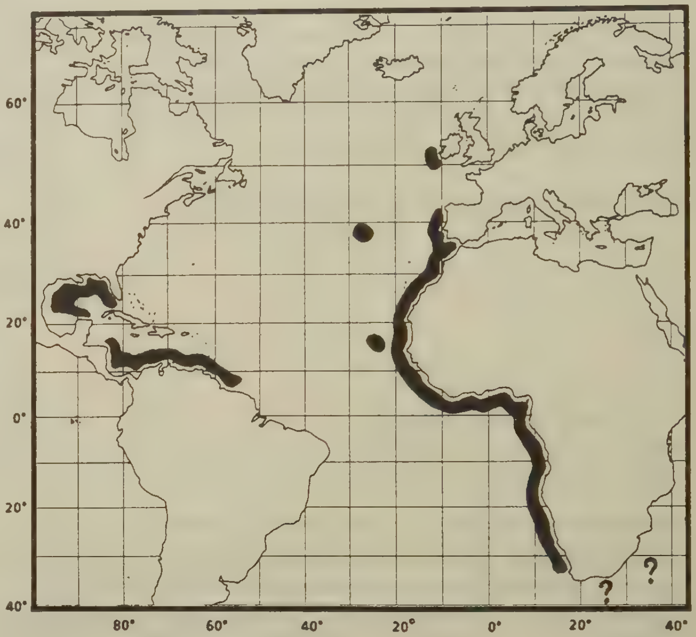


Fig. 184

Remarks: The closely related species ***B. favosus*** is generally found in the same areas as ***B. melanobranchus*** but at greater depths; it is distinguishable by its darker overall colour, 9 pelvic fin rays, and somewhat broader interorbital space (orbit diameter 1.4 to 2.0 into interorbital space). Reports of captures of ***B. melanobranchus*** from depths greater than 1 700 m should be considered suspect, as the species can easily be misidentified as the deeper-living ***B. favosus*** by the uninformed observer.

Gadomus Regan, 1903

MACROUR Gado

Genus with Reference : ***Gadomus*** Regan, 1903, Ann.Mag.Nat.Hist., ser. 7, 11(65):459 [type species ***Bathygadus longifilis*** Goode & Bean, 1885, by original designation].

Diagnostic Features : Chin barbel well developed; interopercle broad, trapezoid-shaped; its ventral margin never deeply concave, generally following that of preopercle; teeth minute, densely packed in narrow to broad bands on jaws, giving shagreen-like texture; olfactory bulbs forward of brain, between orbits. One or more greatly elongated rays in first dorsal, pectoral or pelvic fins. Retia mirabilia in swimbladder 4.

Habitat, Distribution and Biology : Worldwide in tropical to warm-temperate waters, but not over continental margins of the eastern Pacific. Benthopelagic, most living in depths between 400 and 1 100 m.

Size : To about 52 cm total length.

Interest to Fisheries : Very minor at present, but occasionally taken as bycatch. Three of the most abundant species in this genus are ***G. arcuatus*** (North Atlantic), ***G. capensis*** (Southern Africa), and ***G. multifilis*** (Indian Ocean and South Pacific).

Literature : Gilbert & Hubbs (1916, 1920); Iwamoto (1970); Marshall (1973).

Remarks : ***Gadomus capensis*** is the only member of the genus having a chin barbel sometimes shorter than about half the orbit diameter, but it is distinctly longer than the minute ones in ***Bathygadus macrops*** and ***B. sulcatus***. Gilbert & Hubbs (1920:392) provide a key to the species (not including ***G. capensis*** and ***C. aoteanus***).

List of Species :

Gadomus aoteanus McCann & McKnight, 1980
Gadomus arcuatus (Goode & Bean, 1886)
Gadomus capensis (Gilchrist & von Bonde, 1924)
Gadomus colletti Jordan & Gilbert, 1904
Gadomus denticulatus Gilbert & Hubbs, 1920
Gadomus dispar (Vaillant, 1888)
Gadomus introniger Gilbert & Hubbs, 1920
Gadomus longifilis (Goode & Bean, 1885)
Gadomus magnifilis Gilbert & Hubbs, 1920
Gadomus melanopterus Gilbert, 1905
Gadomus multifilis (Günther, 1887)

Gadomus arcuatus Goode & Bean, 1866

Fig. 185

MACROUR Gado 1

Scientific Name with Reference : ***Bathygadus arcuatus*** Goode & Bean, 1886, Bull.Mus.Comp.Zool.Harvard, 12(5):158 [Caribbean Sea off Martinique 14°25'15"N, 60°56'35"W; 607 m; Blake sta. 205, 10 February 1879].

Synonyms : ***Gadomus arcuatus,*** Gilbert & Hubbs, 1920.

FAO Names : **En** - Doublethread grenadier.

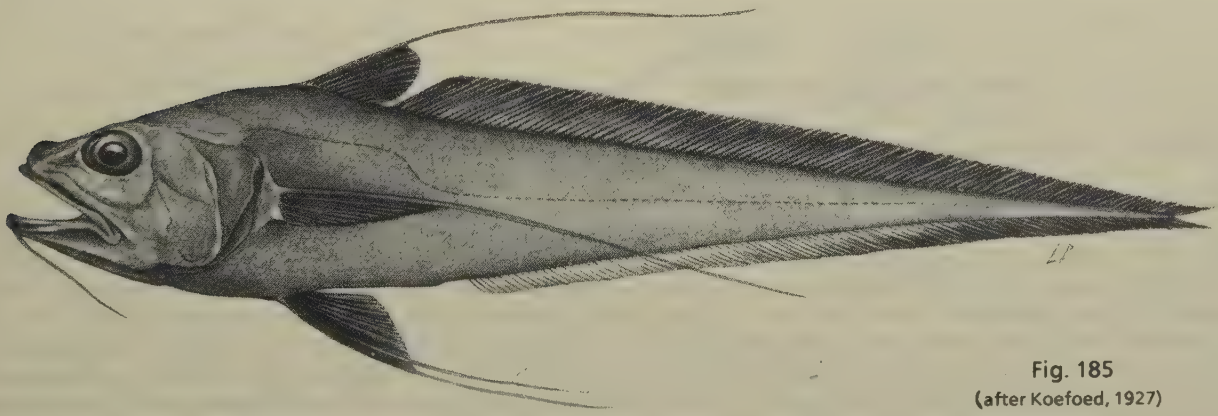


Fig. 185
(after Koefoed, 1927)

Diagnostic Features : Body and flesh relatively firm. Dorsal profile of adults longer than about 30 cm with a pronounced hump-backed appearance. Head bones and integument relatively tough; orbits of moderate size, 18 to 27% of head length, much wider than interorbital space which is 17 to 21% of head length; chin barbel long and prominent, 66 to 87% of head length; outer gillrakers on first arch long and slender, 4 to 6 on upper limb, 18 to 21 on lower limb; teeth very small, aligned in longitudinal series forming a broad band on upper jaw, a moderate to narrow band on lower jaw. First dorsal fin with a rudimentary first ray and a thin, flexible, spinous second ray, followed by 8 to 11 segmented rays; pectoral fin with 22 to 27 rays, the uppermost short, splintlike, the second slightly elongated and filamentous; pelvic fin with 8 rays, outermost two rays elongated, both about equal to or usually much more than length of head. About 30 to 40 simple, slender pyloric caeca.

Geographical Distribution : Tropical North Atlantic. Known from the Gulf of Mexico, Caribbean, and northeastern coast of South America in the western Atlantic; Morocco and the Canary Islands in the eastern Atlantic (Fig. 186).

Habitat and Biology : Benthopelagic in 610 to 1 370 m depth.

Size : To more than 58 cm total length.

Interest to Fisheries : Captured in small numbers in the Gulf of Mexico with the commercial royal red shrimp (***Pleoticus robustus***), but not currently utilized.

Local Names : JAPAN: Yumi-katadara.

Literature : Parr (1946); Marshall (1973).

Remarks : None of the specimens of the species I examined has a prolonged dorsal ray, although Koefoed (1927) and Marshall (1973) have reported such a condition in one or two of their specimens. The closely related ***G. dispar*** can be distinguished from ***G. arcuatus*** in having only the outer pelvic ray prolonged and only 18 to 20 pectoral fin rays.

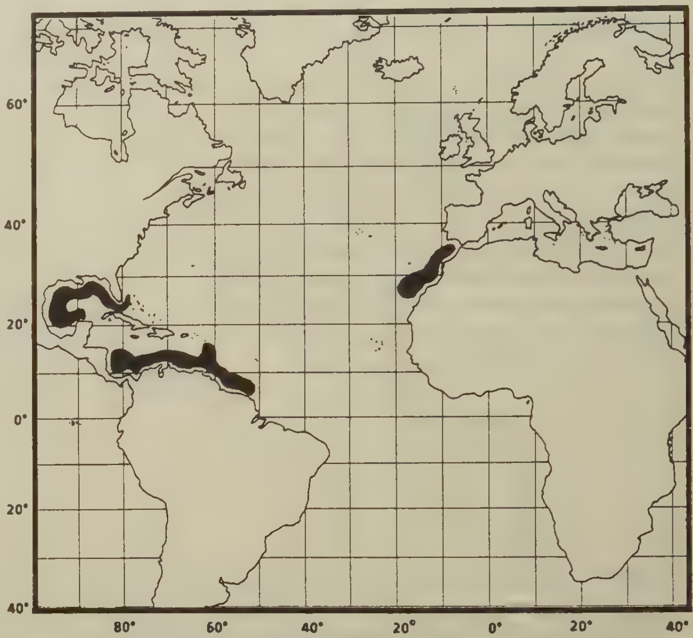


Fig. 186

2.5.2 Subfamily MACROURINAE

Synonyms : Coryphaenoidinae

General Features : Mouth size from wide and almost terminal to small and inferior; jaws protractile; teeth highly variable, from few and fanglike to minute in villiform bands; barbel long, reduced, or absent; olfactory bulbs anterior in position, close behind olfactory organs; branchiostegal rays 6 or 7, rarely 8; first gill slit restricted by folds of skin across upper and lower extent; gillrakers tubercular, fewer than 22 on lower limb of first arch. Two dorsal fins; first dorsal short, with a spikelike first ray closely appressed to spinous second ray, followed by 7 to 12 segmented rays; second dorsal long, separated from the first by a gap longer than half the base of first dorsal, its rays usually short, and not as long as opposite rays of anal fin, which has well developed rays. Abdominal vertebrae 10 to 15. Scales with spinules in most species. Swimbladder well developed in almost all species, with 2 to 11 retia mirabilia; drumming muscles in males of most species. Anus immediately before anal fin or removed to somewhere between pelvic and anal fins. Ventral light organ developed in many species.

Habitat, Distribution and Biology : Worldwide, except in high Arctic waters. Members of this subfamily are found throughout the world's oceans, primarily at continental shelf and slope depths, but some species frequent abyssal depths to as much as 6 500 m, and a few are bathypelagic as adults. Temperature preferences range from near 0°C to more than 10°C. Virtually nothing is known about reproductive habits, but it is speculated that eggs are broadcast near the bottom and develop as they float surfaceward. The few captures of larval stages of macrourids, despite the abundance of adults in most continental slope areas, suggest that once hatched, the larvae develop rapidly, and within a short period descend as juveniles to the bottom. Feeding habits vary widely within the group, as suggested by the varied development of jaws, teeth, snout, and associated feeding structures. At one extreme are the bathypelagic species ***Cynomacrurus piriei*** and ***Odontomacrurus murrayi*** with their terminal jaws and fanglike teeth; at the other extreme are species of ***Coelorinchus*** and ***Mataeocephalus*** with their small, inferior, protrusible jaws and padlike cardiform teeth bands. The spectrum of foods eaten range from polychaetes, clams, snails, sipunculids, and other infauna grubbed from the bottom ooze, to ophiuroids, pagurid and other crabs, holothuroids, and similar epibenthic forms plucked off the bottom, to free-swimming copepods, amphipods, siphonophores, cephalopods, natantid crustaceans, and fishes taken in the water column. Vertical feeding migrations have been documented (Haedrich & Henderson, 1974) in ***Coryphaenoides rupestris*** and may be a common phenomenon among larger members of the genus, such as ***C. acrolepis*** and ***C. filifer***, which are known from pelagic captures. Stein (1985) provided information suggesting that ***C. filifer*** occupies a specific depth stratum well offshore from the continental slope; these horizontal movements away from slope bottoms may well be tied to feeding. A light organ is developed in most genera, none is found in any of the other subfamilies. The organ appears to be most highly developed in the genus ***Coelorinchus***, although it is very complex in ***Hymenocephalus*** and ***Malacocephalus***. ***Hymenocephalus*** and ***Lepidorhynchus*** further have "ventral striae" associated with the light organ; these striae appear externally as parallel narrow black lines over a silvery ground that give a striated pattern to much of the ventral surfaces of the trunk. Similar striae are found in such diverse groups as the merlucciid ***Steindachneria***, the apogonid ***Siphamia***, the percichthyid ***Acropoma***, and the trachichthyid ***Trachichthys***.

Size : Includes the family's smallest and largest species (about 12 cm total length at maturity in some species of ***Hymenocephalus*** to more than 150 cm in ***Albatrossia pectoralis***).

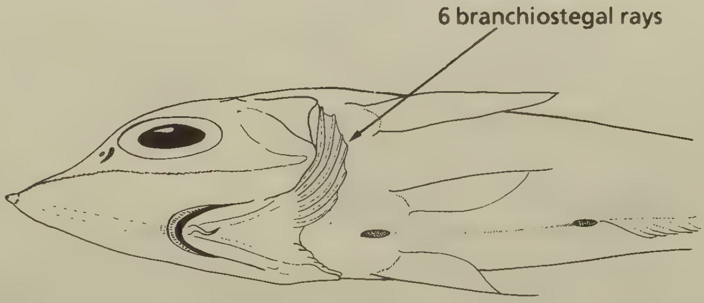
Interest to Fisheries : This subfamily includes the species with the greatest potential for commercial exploitation. A few species already form important fisheries in mid- to high-latitude waters. Many species form a significant part of the bycatch of other targeted fish species and, as such, are used for fish meal, fish paste, and fish oil. Numerous others are found in large enough quantities to warrant further fishery investigation. Many of the smaller forms, though not in themselves of commercial interest, are important forage fish for more valuable species. For example, the abundance of the valuable stockfish (***Merluccius capensis***) of South Africa is directly linked to the abundance of their major prey item, the barred grenadier ***Coelorinchus fasciatus***. The javelin fish (***Lepidorhynchus denticulatus***) of Australia is an important prey for the hoki or blue grenadier (***Macrouronus novaezelandiae***).

Literature : Okamura (1970a); Marshall (1973).

Key to Genera :

1a. Six branchiostegal rays (Fig. 187)

2a. No chin barbel; jaws terminal; lower jaw bearing few large canine teeth (Fig. 188). Swimbladder regressed. Bathypelagic

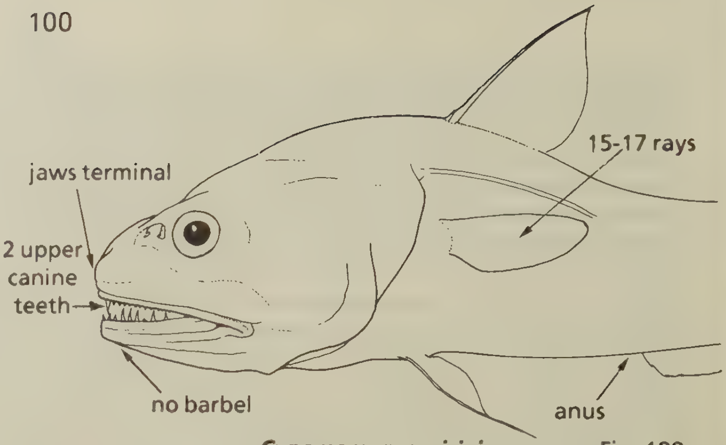


ventrolateral view

Fig. 187

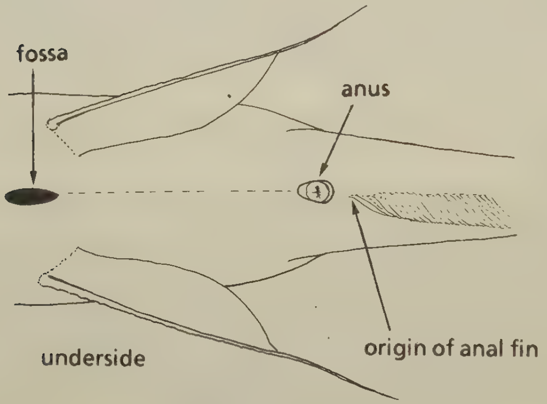
3a. Anus immediately before anal fin origin (Fig. 189). Upper jaw with a pair of large canines near symphysis and a narrow band of small pointed teeth (Fig. 188). Pectoral fins with 15 to 17 rays .... ***Cynomacrurus*** (Fig. 188)

3b. Anus about midway between pelvic and anal fins (Fig. 190). Upper jaw with a single row of pointed retrorse teeth, none especially enlarged (Fig. 191). Pectoral fins with 8 to 11 rays .... ***Odontomacrurus*** (Fig.191)

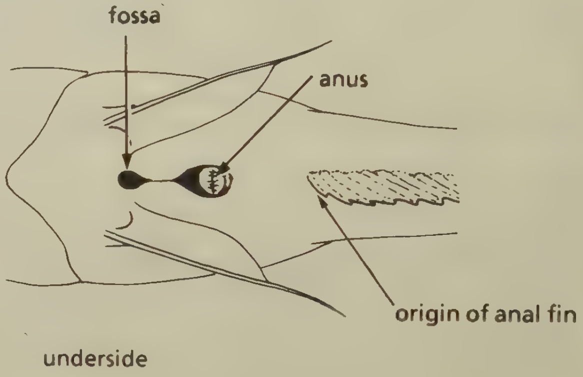

15-17 rays
jaws terminal
2 upper canine teeth
no barbel
anus

Cynomacrurus piriei Fig. 188

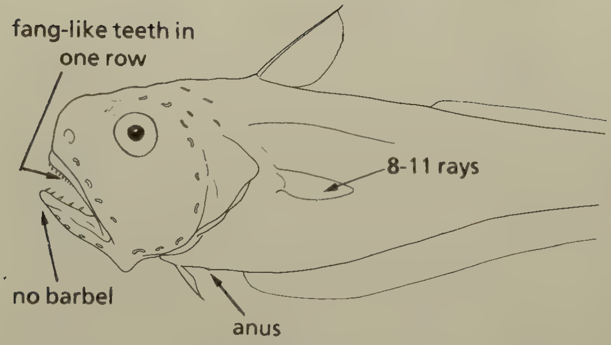
2b. Chin barbel present (except ***Mesobius***); jaws subterminal to inferior (Fig. 192); lower jaw teeth not composed of a few large canines. Swimbladder well developed. Benthopelagic


fossa
anus
underside
origin of anal fin

Coelorinchus Fig. 189


fossa
anus
origin of anal fin
underside

Nezumia Fig. 190


fang-like teeth in one row
8-11 rays
no barbel
anus

Odontomacrurus
(after Iwamoto, 1970)

Fig.191

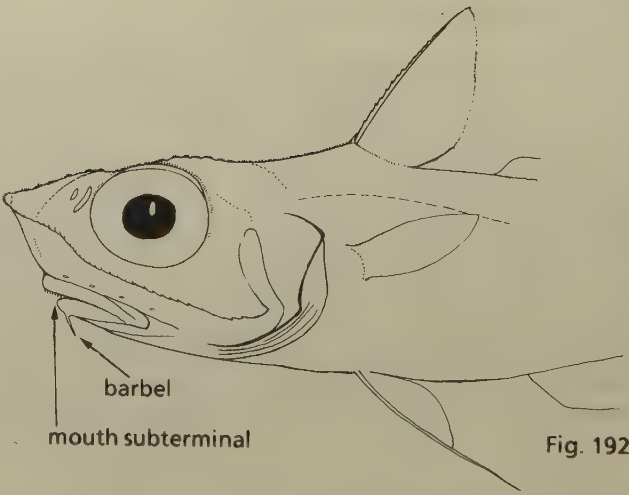

barbel
mouth subterminal

Fig. 192

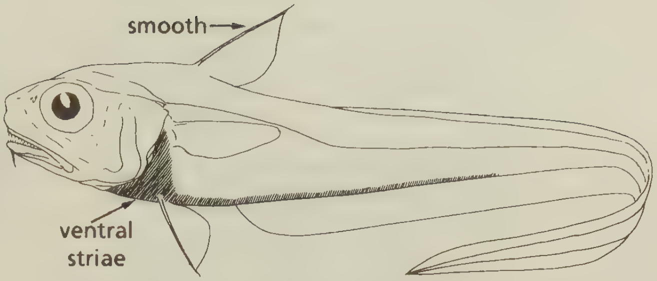
4a, Ventral striae consisting of alternating stripes of black and silvery pigment (associated with luminescent organ) on shoulders, isthmus, ventral surface of abdomen, and along ventral anterior half of tail (Fig. 193). Swimbladder with 9 retia mirabilia ..... ***Lepidorhynchus*** (Fig. 193)

4b. No ventral striae. Swimbladder with 2, 4, 5, 6, or 7 (rarely more) retia mirabilia (Fig. 194)

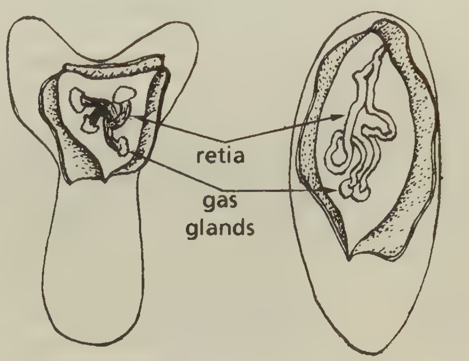
5a. Rakers absent on lateral side of first gill arch (Fig. 195)

6a. Spinous ray of first dorsal fin rounded, with a smooth leading edge (rarely with a few small denticles distally). Pelvic fins with 7 rays (6 in one species). A prominent luminescent organ usually developed .. ***Coelorinchus*** (Fig. 196)

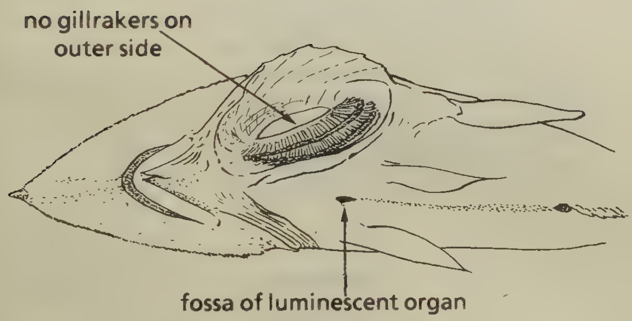
6b. Spinous ray of first dorsal fin truncated in cross-section, with a serrated leading edge (Fig. 197) (serrations sometimes obsolescent). Pelvic fins with 8 to 10 rays. Luminescent organ not readily apparent .... ***Macrourus*** (Fig. 198)


smooth
ventral striae

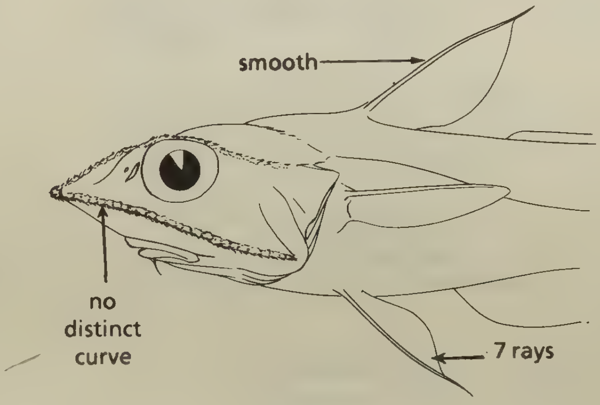
Lepidorhynchus Fig. 193
(after Last, Scott & Talbot, 1983)


retia
gas glands

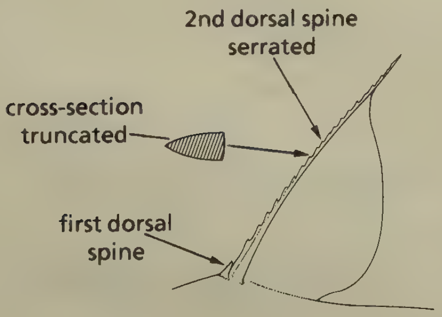
swimbladders Fig. 194


no gillrakers on outer side
fossa of luminescent organ

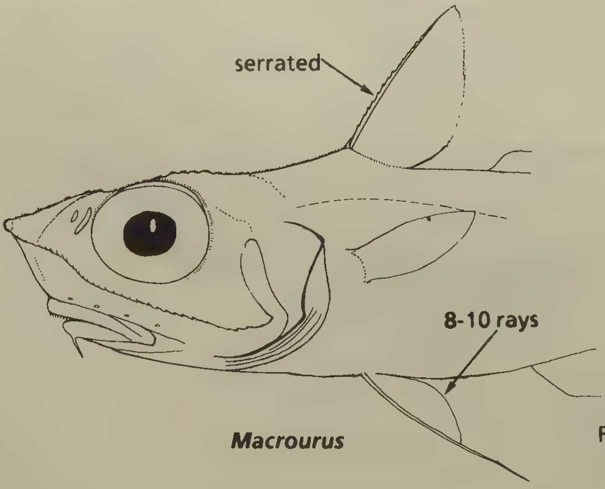
underside ***Coelorinchus*** Fig. 195


smooth
no distinct curve
7 rays

Coelorinchus Fig. 196


2nd dorsal spine serrated
cross-section truncated
first dorsal spine

dorsal fin Fig. 197


serrated
8-10 rays

Macrourus Fig. 198

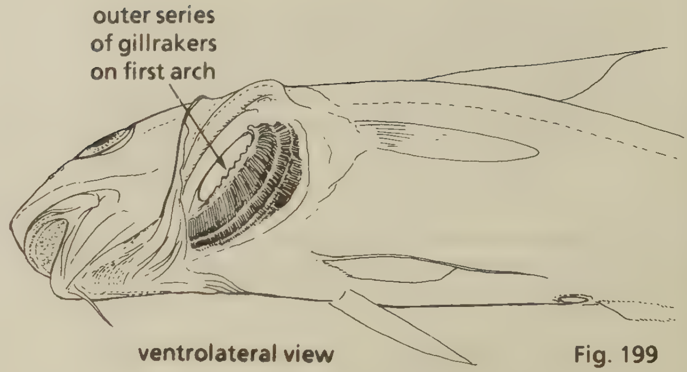
5b. Rakers present on lateral side of first gill arch (Fig. 199)

- **7a.** Anus midway between pelvic and anal fins. Two retia mirabilia in swimbladder ....***Hyomacrurus*** (Fig.200)

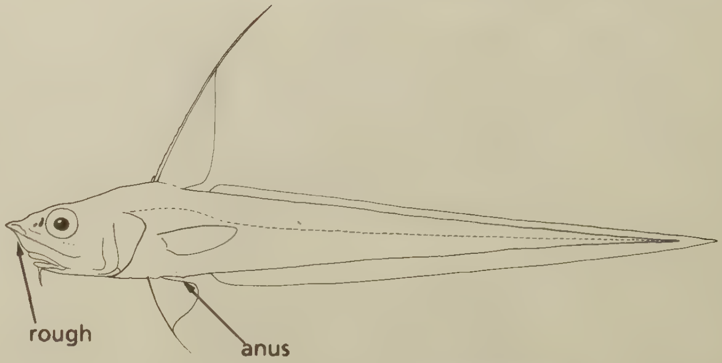
- **7b.** Anus just before origin of anal fin. Two or 4 to 7 retia

  - **8a** Pelvic fins with 6 to 8 (usually 7) rays. Swimbladder small, two retia mirabilia. Large otolith (sagitta) elongated, comblike in smaller fish (Fig. 201). Scales small, 10 or 11 below midbase of first dorsal ....***Albatrossia*** (Fig.202)

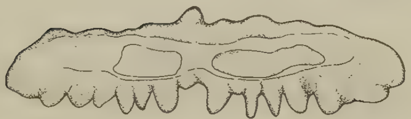
  - **8b.** Pelvic fins with 7 to 14 rays. Swimbladder large, well developed; 2 or 4 to 7 retia. Sagitta relatively short to rounded, not comblike (Fig. 203). Scales small to large, usually fewer than 10 below midbase of first dorsal fin (***C. altipinnis*** and ***C. camurus*** may have more than 10) ... ***Coryphaenoides*** (Fig.204)



ventrolateral view Fig. 199

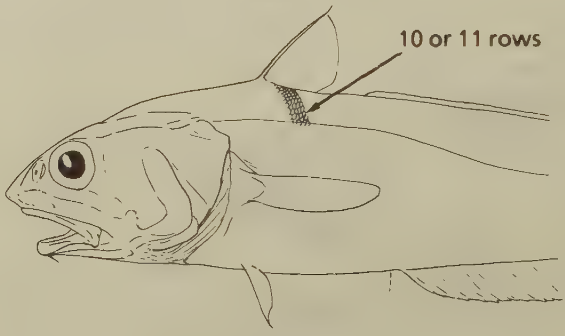


Hyomacrurus Fig. 200
(after Radcliffe, 1912)

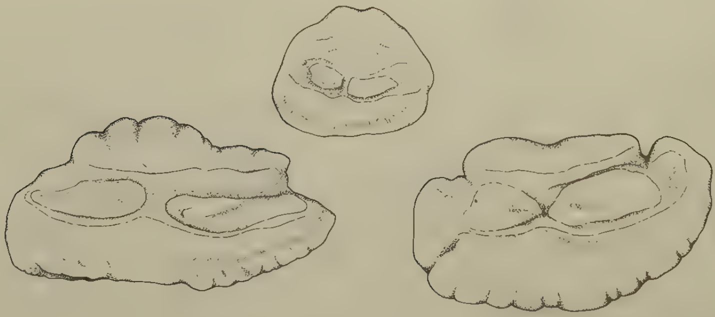


saccular otolith

Albatrossia Fig. 201
(after Schwarzhans, 1979)

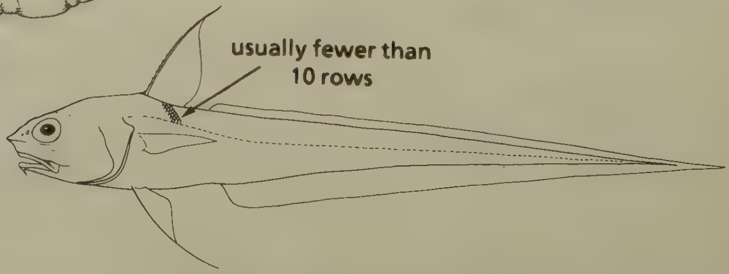


Albatrossia Fig. 202



otoliths

Coryphaenoides Fig. 203
(after Schwarzhans, 1979)



Coryphaenoides (after Gilbert & Burke, 1912) Fig. 204

1b. Seven or eight branchiostegal rays (Fig. 205)

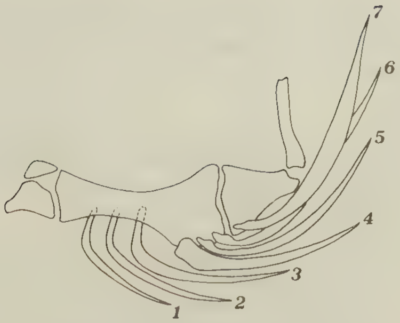
9a. Ventral striae (alternating black and silvery lines) on gular membrane, sides of isthmus, over shoulder girdle, and in a triangular patch above pelvic fins (Fig. 206); integument of head membranous, essentially transparent; head bones thin, fragile

10a. Spinous dorsal ray smooth; more than 15 inner gillrakers on lower limb of first arch ...... ***Hymenocephalus*** (Fig. 207)

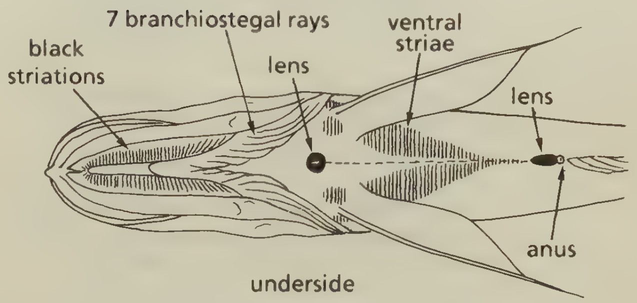
10b. Spinous dorsal ray serrated; fewer than 15 inner gillrakers on lower limb of first arch ...... ***Hymenocephalus*** (subgenus ***Hymenogadus***) (Fig. 208)

9b. No ventral striae; head integument thin to thick, translucent to opaque; head bones not especially fragile

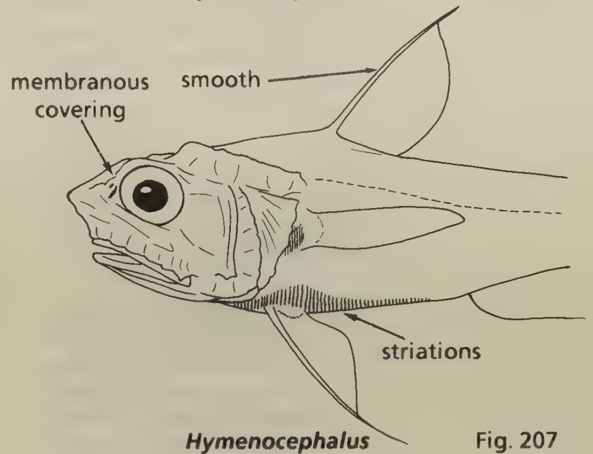
11a. Anus and urogenital opening surrounded by a narrow to broad margin of naked skin, the entire region (the periproct) closely abutting or separated by 1 to 4 scale rows from origin of anal fin, closer to anal fin than to pelvic fins (Fig. 209); no accessory fossa of light organ anterior to anus



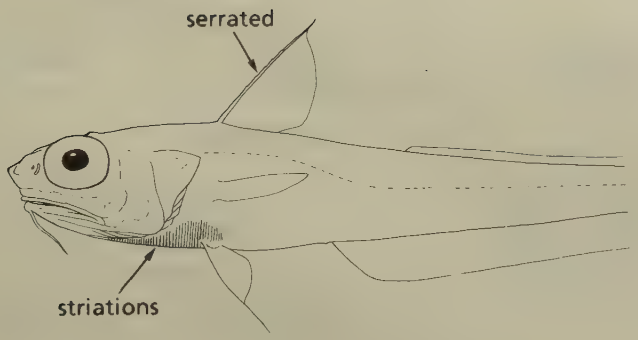
branchiostegal rays Fig. 205
(after Okamura, 1970b)


7 branchiostegal rays
black striations
lens
ventral striae
lens
anus
underside

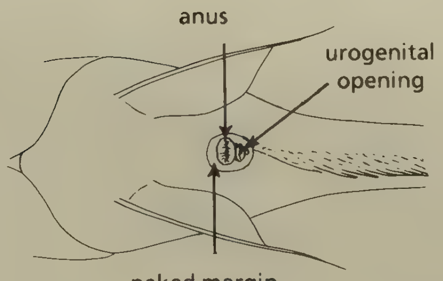
Hymenocephalus Fig. 206


membranous covering
smooth
striations

Hymenocephalus Fig. 207
(after Iwamoto, 1970)


serrated
striations

subgenus ***Hymenogadus*** Fig. 208
(after Gilbert & Hubbs, 1920)


anus
urogenital opening
naked margin

underside Fig. 209

12a. Spinous ray of first dorsal fin smooth; pelvic fin origins below base of first dorsal, far behind level of pectoral fin origins .... *Trachonurus* (Fig. 210)

12b. Spinous ray of first dorsal fin weakly to strongly serrated; pelvic fin origin below or anterior to pectoral fin bases

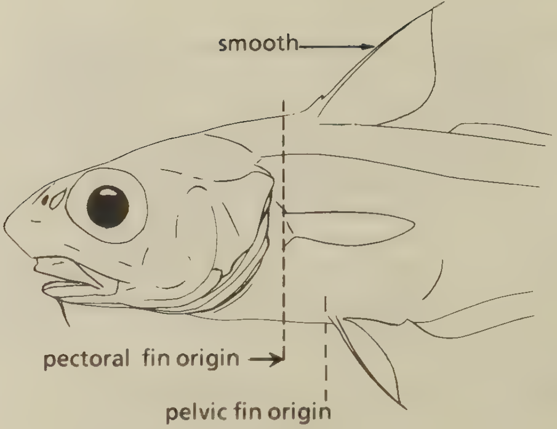
13a. Snout long, pointed, dorsoventrally depressed, armed with a bifid terminal scute and a row of stout scales along leading edge; suborbital ridge strongly developed, demarcated by stout, scutelike scales. No outer series of rakers on first gill arch (Fig. 195) .... ***Mataeocephalus*** (Fig. 211)

13b. Snout short to moderately long, rounded to pointed, but not dorsoventrally depressed; terminal and lateral scutes may or may not be developed; suborbital ridge weak or relatively strong. An outer series of rakers on first gill arch (Fig. 199)

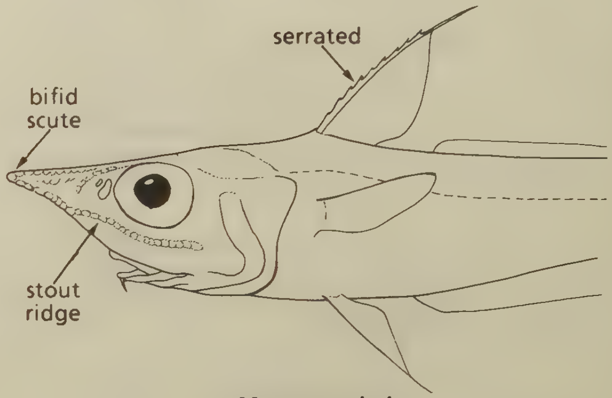
14a, Barbel absent; head scales elongated, with spinules in 1 to 3 ridgelike rows that give a characteristic striated pattern to head surfaces ..... ***Mesobius*** (Fig. 212)

14b. Barbel small to large; head scales not elongated, spinule arrangement various but not as for ***Mesobius***

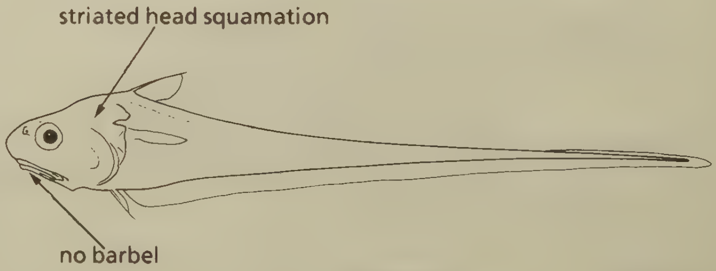
15a. Head massive, broad, deep, swollen by the expansive cephalic lateral line canals (Fig. 213); almost entirely scaled, without broad naked areas


smooth
pectoral fin origin
pelvic fin origin

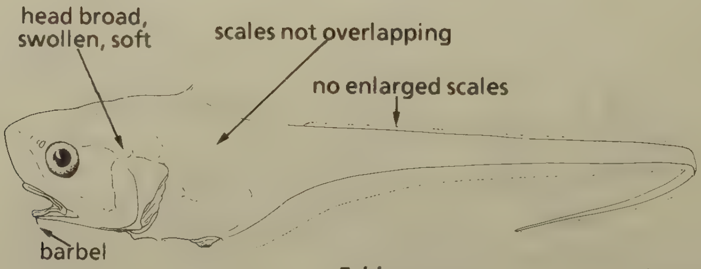
Trachonurus Fig. 210


serrated
bifid scute
stout ridge

Mataeocephalus Fig. 211


striated head squamation
no barbel

Mesobius Fig. 212
(after Iwamoto, 1979)


head broad, swollen, soft
scales not overlapping
no enlarged scales
barbel

Echinomacrurus Fig. 213
(from Iwamoto, 1979)

16a. No enlarged scales along first or second dorsal fin. Scales on belly large, almost platelike. Swimbladder regressed or absent .... ***Echinomacrurus*** (Fig. 213)

16b. A series of enlarged scales along first and second dorsal fins (Fig. 214). Scales on belly of normal size. Swimbladder well developed .... ***Cetonurus*** (Fig. 215)

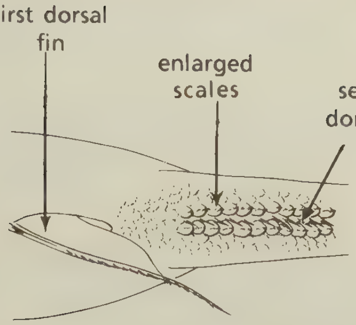
15b. Head not especially inflated; mostly scaled or with broad naked areas

17a. Jaws set at an oblique angle. Snout blunt, shorter than orbit diameter; armed with a stout scute at tip and lateral angles; suborbital ridge stout, scutelike scales developed ....***Sphagemacrurus*** (Fig. 216)

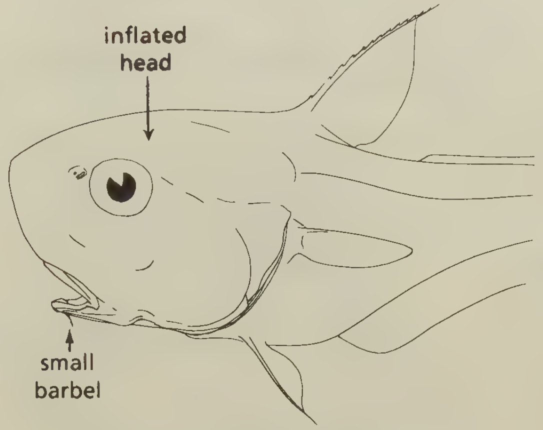
17b. Jaws more horizontal; snout rather blunt to moderately pointed, not armed with stout tubercular scutes; suborbital ridge without scutelike scales

18a. Olfactory organ massive, almost equal to orbit diameter (Fig. 217). Scales absent on snout .. ***Macrosmia*** (Fig. 218)

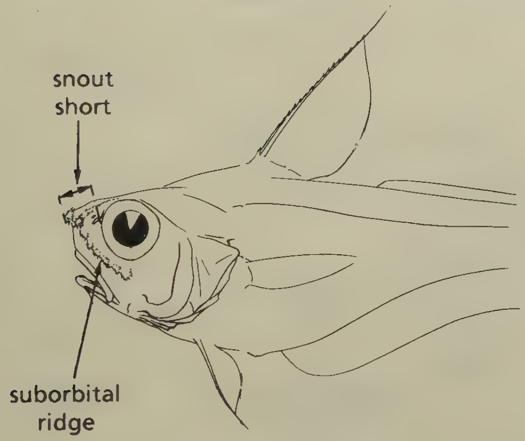
18b. Olfactory organ not especially large, much less than half of orbit diameter. Scales present or absent on snout


first dorsal fin
enlarged scales
second dorsal fin

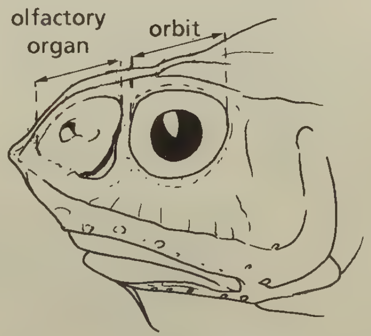
upper side ***Cetonurus*** Fig. 214


inflated head
small barbel

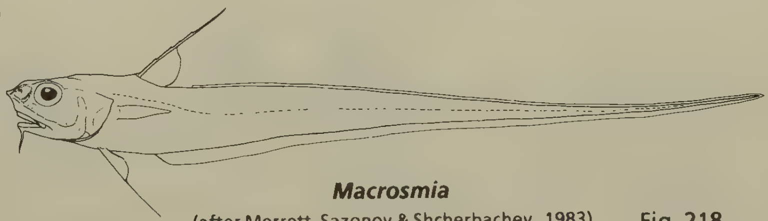
Cetonurus Fig. 215


snout short
suborbital ridge

Sphagemacrurus Fig. 216


olfactory organ
orbit

Macrosmia Fig. 217
(after Merrett et al., 1983)



Macrosmia Fig. 218
(after Merrett, Sazonov & Shcherbachev, 1983)

19a. Snout and suborbital area completely scaled .... ***Paracetonurus*** (Fig. 219)

19b. Underside and anterodorsal parts of snout, and underside of suborbital area naked .... ***Asthenomacrurus*** (Fig. 220)

11b. Periproct distinctly separated from anal fin origin, usually closer to pelvic fin insertions (Fig. 221); a small to moderate-sized black fossa often present before periproct

20a. No gillrakers on outer side of first arch (Fig. 195) .... ***Mataeocephalus*** (Fig. 211)

20b. Outer gillrakers present on first arch (Fig. 199)

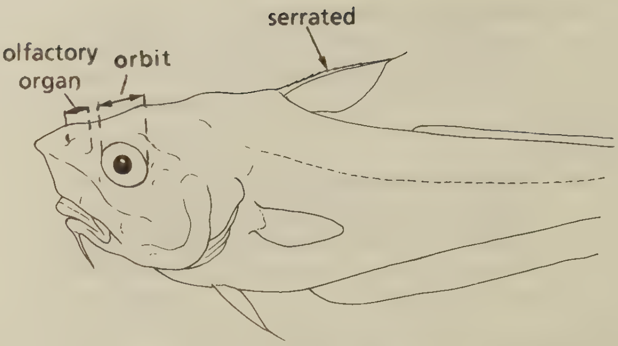
21a. Jaws almost terminal; upper jaws extend posteriorly to vertical through anterior margin of orbits. Snout and ventral parts of head naked; head scales and anterior body scales without spinules. Pectoral fins with 26 to 29 rays .... ***Haplomacrurus*** (Fig. 222)

21b. Jaws subterminal to inferior; upper jaws extend well beyond anterior margin of orbits. Naked areas on snout and head variously developed; scales all with spinules, except near fin bases or under gill cover. Pectoral fins with 26 or fewer rays

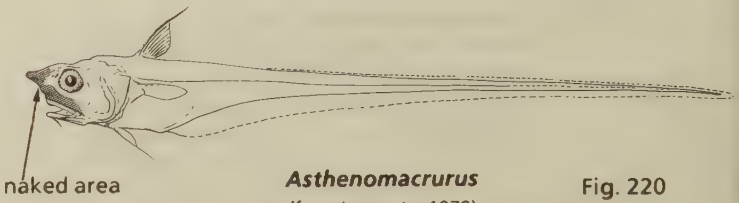
22a. First dorsal spine smooth

23a. Upper jaw less than 30% of head length; barbel very small. No separate naked fossa anterior to periproct .... ***Kumba*** (Fig. 223)

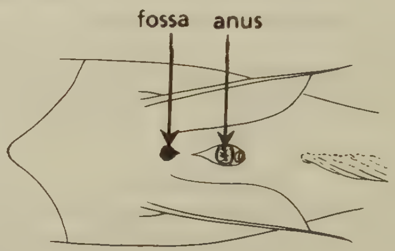
23b. Upper jaw more than 40% of head length; barbel moderate to large. A naked fossa anterior to periproct (Fig. 221)



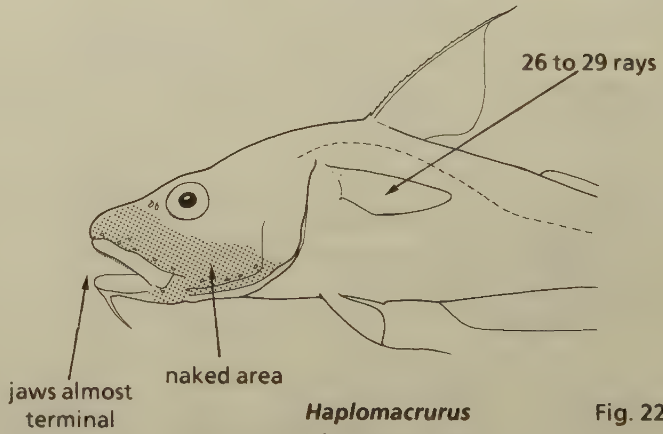
Paracetonurus Fig. 219



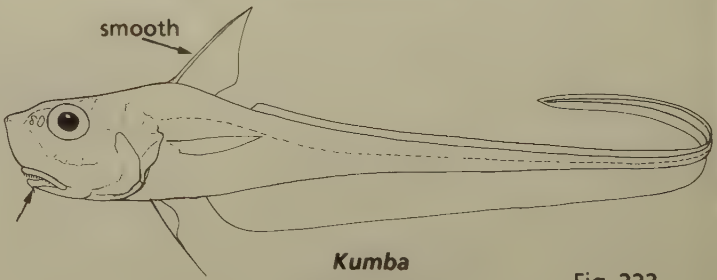
Asthenomacrurus (from Iwamoto, 1979) Fig. 220



underside Fig. 221



Haplomacrurus (after Trunov, 1980) Fig. 222



Kumba (after Marshall, 1973) Fig. 223

24a. Lower jaw teeth large, widely spaced, in 1 row; a large, broad, naked fossa anterior to periproct. Scales present on lowermost branchiostegal rays ... ***Malacocephalus*** (Fig.224)

24b. Lower jaw teeth moderate to small, closely spaced, in 1 or more rows; naked fossa small to moderate-sized. No branchiostegal scales .... ***Ventrifossa*** (Fig.225)

22b. Spinous first dorsal ray weakly to strongly serrated

25a. Lower jaw teeth large, widely spaced, in 1 row ..... ***Malacocephalus*** (Fig.224)

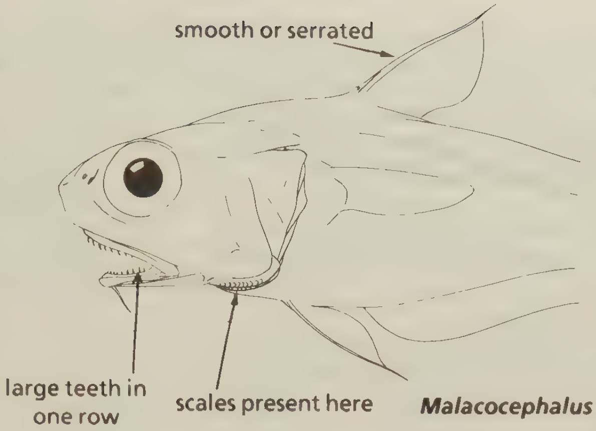
25b. Lower jaw teeth small to moderate-sized, closely spaced, in 1 or more rows

26a. Enlarged scales along dorsal fins. A large bifid terminal snout scute present (Fig. 226a). No anterior fossa of light organ. Head fully scaled, including branchiostegal and gular membranes ...... ***Cetonurichthys*** (Fig.226)

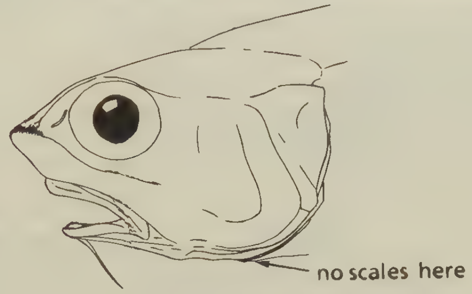
26b. No enlarged scales along dorsal fins. Terminal snout scute present or absent. Head variously scaled

27a. No external sign of luminescent organ. Pelvic fins with 6 rays . ***Pseudonezumia*** (Fig.227)

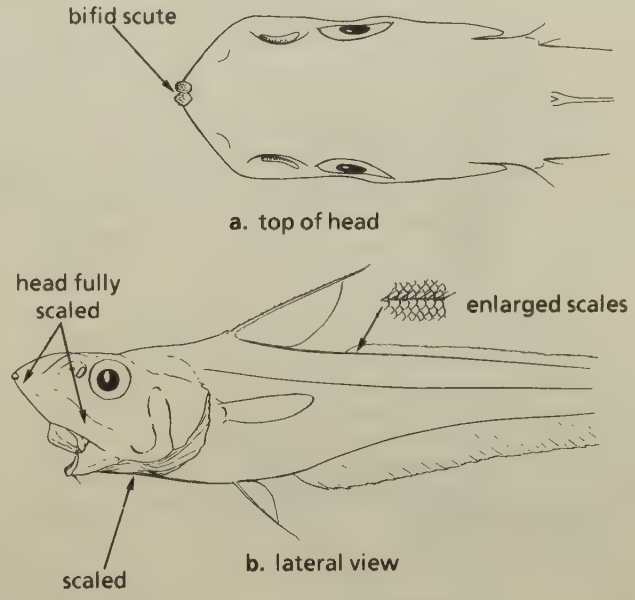
27b. Luminescent organ well developed, usually with a naked fossa anterior to periproct (Fig. 221). Pelvic fins with 7 to 17 rays


smooth or serrated
large teeth in one row
scales present here

Malacocephalus Fig. 224


no scales here

Ventrifossa Fig. 225

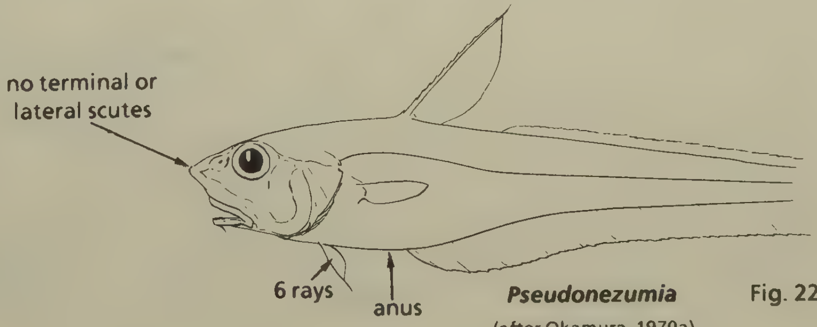

bifid scute
head fully scaled
enlarged scales
scaled

a. top of head

b. lateral view

Cetonurichthys Fig. 226

(after Sazonov & Shcherbachev, 1982)


no terminal or lateral scutes
6 rays
anus

Pseudonezumia Fig. 227

(after Okamura, 1970a)

28a. Head large, broad, deep; interorbital width greater than orbit diameter, about 35 to 40% of head length; chin barbel very short to rudimentary, less than 10% of head length, 3.5 or more times into orbit diameter

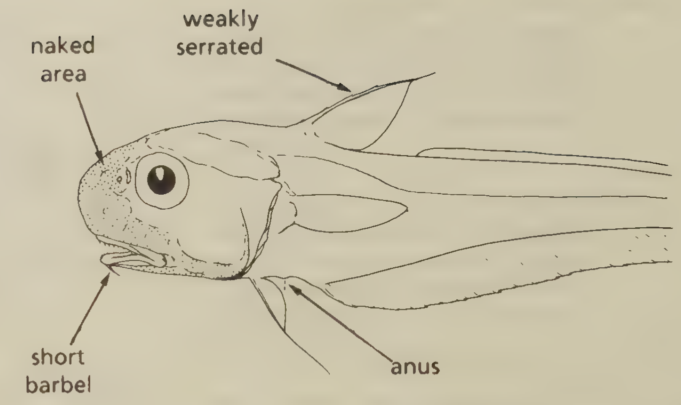
29a. Snout and ventral parts of head naked .... ***Parakumba*** (Fig.228)

29b. Almost all of head uniformly scaled .... ***Pseudocetonurus*** (Fig.229)

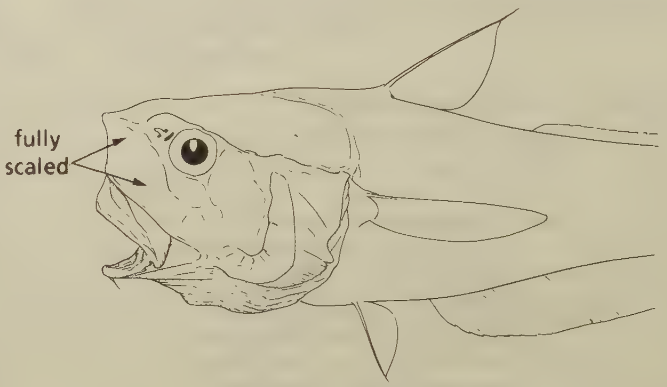
28b. Head not especially large and broad, laterally compressed if deep, or dorsoventrally somewhat depressed if broad; interorbital space about equal to or (usually) less than orbit diameter; chin barbel short to long, more than 5% of head length

30a. Snout and suborbital region completely and uniformly covered with small, finely spinulated scales; a tubercular scute at tip of snout present in some; length of upper jaw more than 1/3 of head length

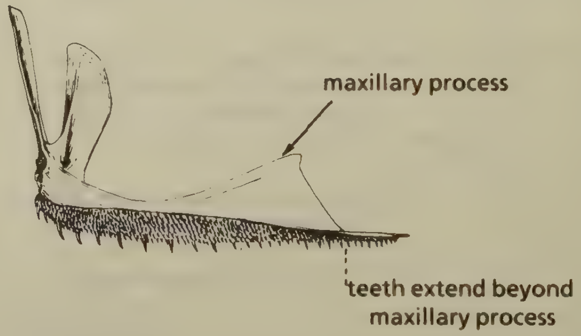
31a. Premaxillary teeth in a narrow band that extends posteriorly beyond maxillary process (Fig. 230); mandibular teeth in 1 to 3 irregular series. Snout with blackish tip, or entire leading edge blackish (Fig. 231). Inner gillrakers on first arch 13 to 20. Mouth large; upper jaws 35 to 53% of head length. Pores of cephalic lateral line system small and inconspicuous .. ***Ventrifossa*** (Fig.231)


naked area
weakly serrated
short barbel
anus

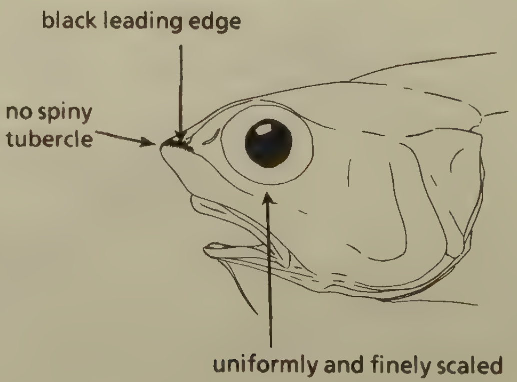
Parakumba Fig. 228
(after Trunov, 1981)


fully scaled

Pseudocetonurus Fig. 229


maxillary process
teeth extend beyond maxillary process

right premaxillary (medial view) Fig. 230
Ventrifossa


black leading edge
no spiny tubercle
uniformly and finely scaled

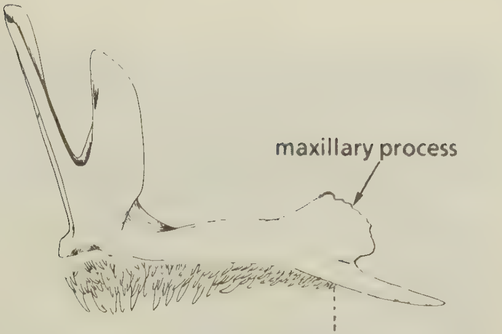
Ventrifossa Fig. 231

31b. Premaxillary teeth in narrow to broad short band that falls short of posterior margin of maxillary process (Fig. 232). Mandibular teeth in a narrow to broad band. Snout tip and leading edge not darkly marked. Inner gillrakers on first arch 7 to 16 (total). Mouth moderate in size, upper jaws 33 to 45% of head length. Pores of cephalic lateral line system conspicuous or inconspicuous

32a. Colour pale brown to blackish; no silvery pigmentation; fins uniformly blackish. Inner gillrakers 8 to 11 (total) on first arch. Lowermost branchiostegal rays scaled in some species. Lips thick, papillaceous. Teeth in short broad bands that taper rapidly posteriorly .... ***Nezumia*** subgenus ***Kuronezumia*** (Fig. 233)

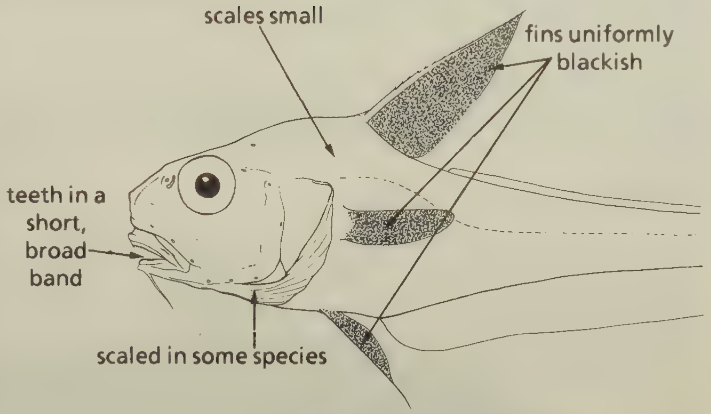
32b Colour pale brownish to greyish; silver pigmentation ventrally in fresh specimens; fins often with black blotches or streaks. Inner gillrakers of first arch 7 to 16 (total). Lowermost branchiostegal rays usually with some scale patches. Lips not especially thick and papillaceous. Teeth in relatively narrow bands ... ***Ventrifossa*** subgenus ***Lucigadus*** (Fig. 234)

30b. Naked areas usually present on snout, especially ventrally, often extending into ventral suborbital region, mandible and lower margin of preopercle. Upper jaws usually less than 1/3 of head length. Suborbital shelf usually strongly developed, with a double row of deeply embedded scutelike scales........... ***Nezumia*** (Fig. 235)


maxillary process
no teeth beyond max. proc.

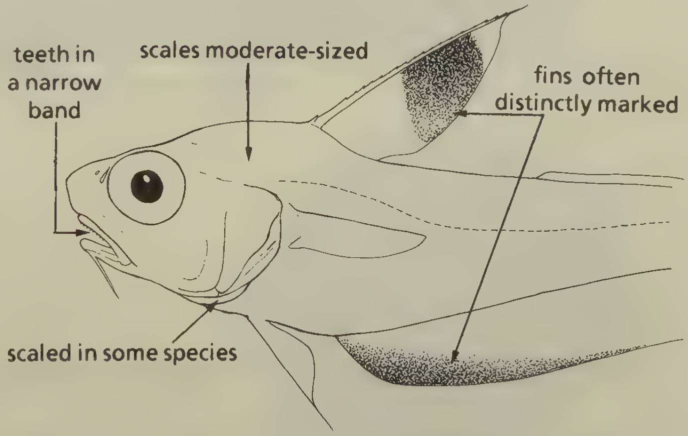
right premaxillary (medial view)

Nezumia Fig. 232

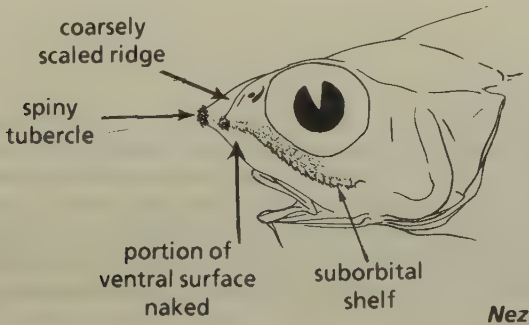

scales small
fins uniformly blackish
teeth in a short, broad band
scaled in some species

subgenus ***Kuronezumia*** Fig. 233

(after Iwamoto, 1974)


teeth in a narrow band
scales moderate-sized
fins often distinctly marked
scaled in some species

subgenus ***Lucigadus*** Fig. 234


coarsely scaled ridge
spiny tubercle
portion of ventral surface naked
suborbital shelf

Nezumia Fig. 235

Albatrossia Jordan & Evermann, 1898

MACROUR Alb

Genus with Reference : ***Albatrossia*** Jordan & Evermann, 1898, Bull.U.S.Natl.Mus., 47(3):2573 [type species ***Macrurus pectoralis*** Gilbert, 1892, by original designation].

Synonyms : ***Dolloa*** Jordan, 1900.

This genus includes a single species.

Albatrossia pectoralis (Gilbert, 1892)

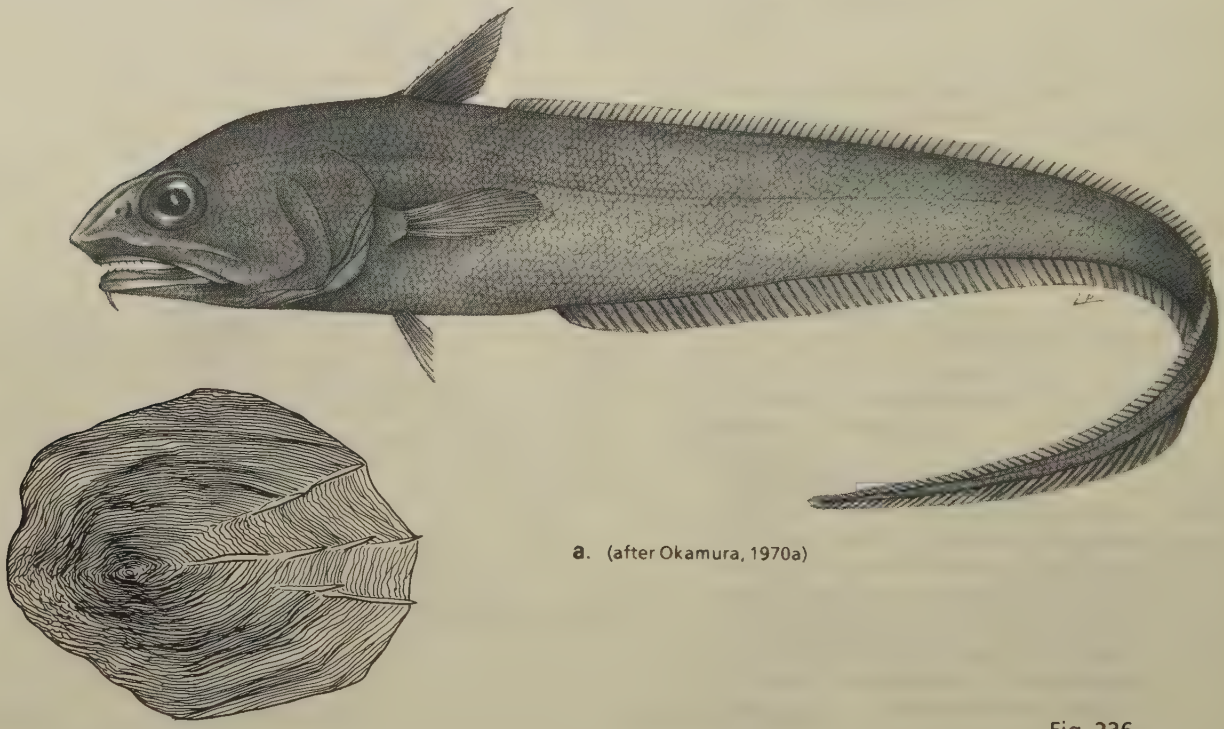
Fig. 236

MACROUR Alb 1

Scientific Name with Reference : ***Macrurus*** (***Malacocephalus***) ***pectoralis*** Gilbert, 1892, Proc.U.S.Natl. Mus., (1891)14:563 [off Oregon in 1 253-1 604 m].

Synonyms : ***Macrurus*** (***Nematonurus***) ***magnus*** Gill & Townsend, 1897; ***Coryphaenoides*** (***Nematonurus***) ***pectoralis*** - Gilbert & Hubbs, 1916; ***Coryphaenoides pectoralis*** - Taranetz, 1937; ***Nematonurus pectoralis*** - Andriashev, 1937; ***Chalinura pectoralis*** - Rass, 1963; ***Dolloa pectoralis*** Jordan, 1900.

FAO Names : En - Giant grenadier.



a. (after Okamura, 1970a)

b. scale

Fig. 236

Diagnostic Features : A macrourine with 6 branchiostegal rays. Snout low, slightly protruding beyond the large mouth, without a spinous terminal scute; upper jaw about 40 to 45% of head length, extends beyond vertical through hind edge of orbit; premaxillary teeth in long narrow band, the outer teeth large; mandibular teeth in 1 to 3 irregular series. Large otolith (sagitta) long, somewhat comb-like in shape. First dorsal fin with 2 spinous rays and 7 to 9 segmented rays, second spinous ray weakly serrated; pelvic with 6 to 8 rays, usually 7. Anus at anal fin origin. Scales small, elongated, with moderate-sized median ridge, unarmed or with few weak spinules, and 0 to 5 much lower, non-spinulated ridges laterally on exposed field. Swimbladder small, 2 retia mirabilia. Abdominal vertebrae 13 to 15.

Geographical Distribution : North Pacific from northern Japan to the Okhotsk and Bering seas, east to the Gulf of Alaska, south to northern Baja California(Fig. 237).

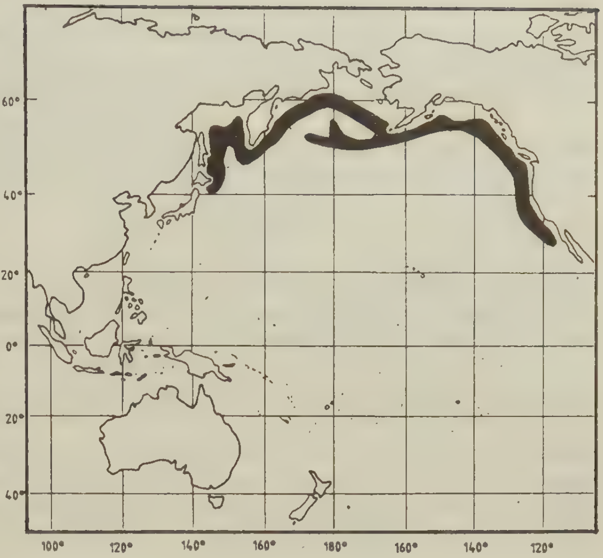


Fig. 237

Habitat and Biology : A species of temperate to subarctic seas in about 140 to 1 200 m depth. Off northern Japan it occurs in waters of 0 to 2°C. Novikov (1970) gives the most detailed information on the general biology of the species. The young are apparently bathypelagic to some degree and descend to the bottom at a size of about 50 to 60 cm. Spawning takes place over a prolonged period, but is most vigorous in autumn and winter. Food preferences vary with locality, but cephalopods, fish, and shrimp predominate. Ctenophores are another important food item; echinoderms, worms, crabs, and amphipods play a lesser role in the diet of the species.

Size : To more than 150 cm total length.

Interest to Fisheries : Considered by Soviet investigators to be a valuable food fish, but the water-logged flesh makes it unappealing for direct consumption. The eggs and liver contain up to 50% vitamin-rich fats. Catches by the Soviets in the Bering Sea in 1962-1965 amounted to as much as 4 to 6 t per haul. ***Albatrossia pectoralis*** is found in commercially exploitable quantities in most areas where it occurs, but aside from the Soviet fisheries for the species in the Bering and Okhotsk seas in the sixties, it has not been targeted for exploitation. It, however, remains a significant part of the bycatch for more desirable species in those areas. Caught incidentally in the Japanese longline fishery. The Japanese-US longline survey of the North Pacific population reported a 37% increase in the relative population numbers from 1985 to 1986.

Local Names : CANADA: Pectoral rat-tail; JAPAN: Munedara; USA: Giant grenadier.

Literature : Novikov (1970); Okamura (1970); Iwamoto & Stein (1974); Amaoka et al. (1983).

Remarks : The highly distinctive otolith, the rather peculiar squamation, the reduced swimbladder, and the two retia mirabilia and gas glands, in combination, distinguish this genus from related genera.

Coelorinchus Giorna, 1810

MACROUR Coel

Genus with Reference : ***Coelorinchus*** Giorna, 1809, Mem.Accad.Sci.Torino, 16:179 (type species ***Lepidoleprus coelorhincus*** Risso, 1810 by subsequent designation of Goode & Bean, 1896.

Synonyms : ***Coccolus*** Bonaparte, 1846; ***Paramacrurus*** Bleeker, 1874; ***Abyssicola*** Goode & Bean, 1896; ***Quincuncia*** Gilbert & Hubbs, 1920; ***Garichthys*** Whitley, 1934, ***Mahia*** McCann & McKnight, 1980.

Diagnostic Features : A macrourine with 6 branchiostegal rays. Outer gill slit greatly restricted; no gill rakers on outer side of first arch; a stout suborbital ridge consisting of enlarged strengthened scales running from snout tip to near posteroventral angle of preopercle - the ridge consisting of three sections (nasal, infraorbital, and preopercular) usually closely adjoined, but often with distinct separations between sections; nasal portion forming anterolateral margin of snout (lateral nasal ridge) supported to various degrees by extensions of median and lateral processes of nasal bone; snout variously developed, from short and blunt to elongated and sharply pointed; mouth inferior, upper jaw usually about 20% to 35% of head length; ridges of head usually rather strong, stout, scutelike, and spiny. Second spinous ray of first dorsal fin usually rounded and smooth along leading edge, but infrequently with a few weak teeth distally; pelvic fins almost always with 7 rays (but normally 6 in ***C. sexradiatus***). Ventral light organ variously developed; in some, the organ is small and short, scarcely noticeable as a blackish extension of the perianal region; in most others, it extends anteriorly a considerable distance, almost to the isthmus in some, to pelvic fin bases or on abdomen in others; anterior and posterior ends usually expanded and forming a naked fossa, but in some species, the light organ is completely covered with scales and externally visible only as a dark midventral streak.

Anus usually immediately before or close to anal fin origin, about midway to pelvic bases in one species. Scales of body covered with spinules which range from short, slender, conical, in a random or quincunx order to broad, coarse, keel-like spinules in discrete ridgelike rows. Abdominal vertebrae 11 to 12. Swimbladder oval to strongly bilobed anteriorly; retia mirabilia usually 4, but in one species as many as 11.

Habitat Distribution and Biology : Worldwide in tropical to temperate seas, a few species found near the Antarctic Convergence; benthopelagic in 33 to 2 220 m, but most in depths between 150 and 800 m.

Size: To 75 cm, but most species less than 30 cm.

Interest to Fisheries : Most members of this genus are found in relatively shallow waters of the continental slope, making them susceptible to capture by commercial trawlers. Several species are taken as bycatch of trawls and utilized for fish meal or fish paste. A few larger species are of possible commercial interest.

Literature : Gilbert & Hubbs (1920); Okamura (1970a, b); Marshall & Iwamoto (in Marshall, 1973); Iwamoto (1978).

Remarks : More than 76 species are currently recognized, many more still undescribed, including nine that the author has examined in Soviet collections from the Indian Ocean. It seems likely that more than 100 species will be recognized after collections have been thoroughly studied. The key to species given by Gilbert & Hubbs (1920:425 to 432) serves to adequately identify the 51 species then known.

Key to Species of *Coelorinchus*

Because of the size of the genus (76 species recognized here), it was found convenient to treat the members in four separate groups based primarily on the development of the ventral light organ, a feature common to all members of the genus, but variously developed in each. This allowed reducing the size of each key to more manageable (although still large) units. The four groups are artificial and the inclusion of a species within a certain group is not meant to imply a close relationship to other members of that group. Similarly, the proximity of one species to another in a key does not imply a close relationship of the two, although this may often be the case because of shared characters.

The light organ always lies along the median ventral line in front of the anus. It varies markedly in size and internal complexity, but for its use here, only the length and size of the externally visible portions are considered, although the internal development is usually reflected in the external appearance.

In the first group, the light organ is short and present only as a small sac in the belly wall, often not externally apparent. In the other three groups, the organ is larger and extends farther forward, to as much as the chest just behind the isthmus in some. It is manifested in these groups as a blackish streak, a narrow blackish cleft, as one or two narrow to broad fossae, as elongated lens-shaped swellings, or as alterations or combinations of these. In some species, the fossa is naked and readily apparent, whereas in others the fossa is overlain with scales that obscure its presence.

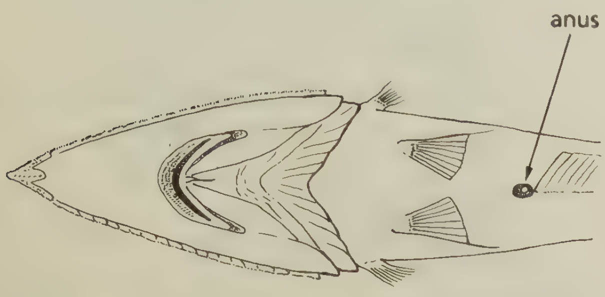
Assigning a specimen to one of the four groups will usually not be much of a problem, but it will on occasion. The abdominal area is often damaged in macrourids making interpretation of the shape and extent of the light organ difficult. In some species the organ is more visible externally than in others because of the lack of scale covering or because of its size, shape and colour. The greatest difficulty will be encountered in assigning certain species to either Group I or Group II. ***Coelorinchus braueri*, *C. japonicus*, *C. smithi*** and ***C. spinifer*** are keyed out in both groups for this reason. ***C. tokiensis*** would also have been keyed out twice if the light organ character were the only consideration, but that species has a prominent banded pattern, which excludes it from Group I.

As a general rule, all specimens should be run through the key choosing each part of a couplet that best fits the characters observed. When a species is finally chosen, the specimen should be compared with the illustrations and description (if available). If the specimen does not agree well with the figure and description, the key should be backtracked to a couplet that posed a problem of choice, and the alternative track run through until a "best fit" is obtained. This may mean returning all the way back to the choice of a group. As many species are yet to be described and variation among each species could be considerable, a final identification may not be possible. Young specimens are particularly problematic in that they often show developmental differences in the characters used here.

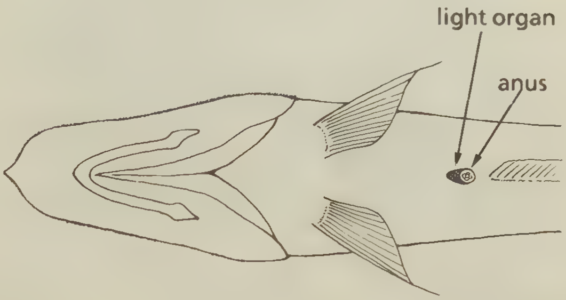
The genus as a whole is currently being studied by Dr Osamu Okamura. Information and figures from his two main works (1970a, b) on Japanese Macrouroidei have been especially useful in developing these keys.

Guide to Groups of Species:

Group I (page 115) : Little or no external evidence of light organ; black oval or crescentic naked area, if present, shorter than posterior nostril; no prominent markings on body (e.g., saddlemarks, stripes, bands, pectoral blotches, vermicula-tions, etc.) except in ***C. kaiyomaru*** and ***C. quadricristatus***. Examples:

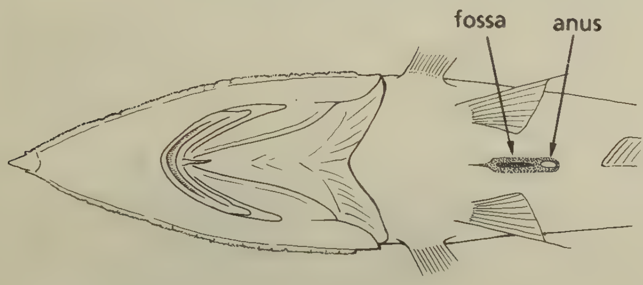


underside ***C. gilberti*** Fig. 238
(after Okamura, 1970b)

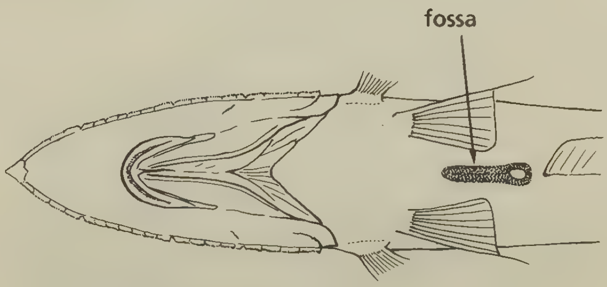


underside ***C. aconcagua*** Fig. 239
(after Iwamoto, 1978)

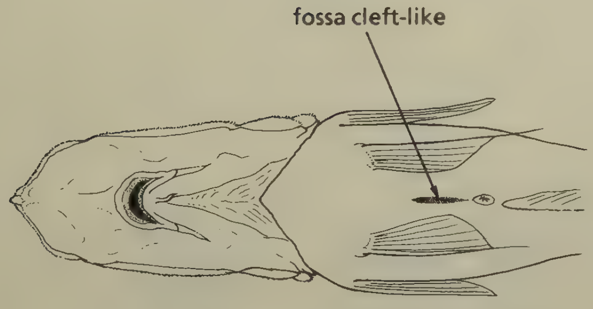
Group II (page 123): A distinct blackish fossa on belly (obscured by scale covering in some species); fossa narrow and cleft-like in some, broad and lens-like or teardrop-shaped in others, usually with a short connection to periproct (region surrounding anal and urogenital openings); anterior end of fossa fails to extend forward of line connecting pelvic fin bases. Examples:



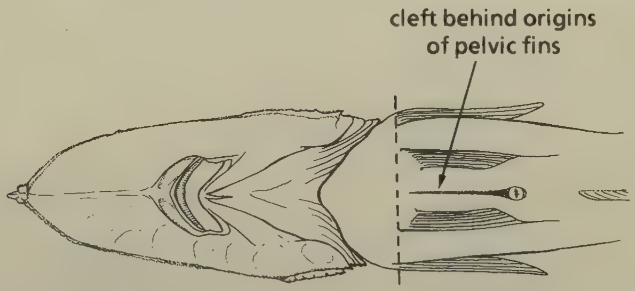
underside ***C. smithi*** Fig. 240
(after Okamura, 1970b)



underside ***C. asteroides*** Fig. 241
(after Okamura, 1970b)

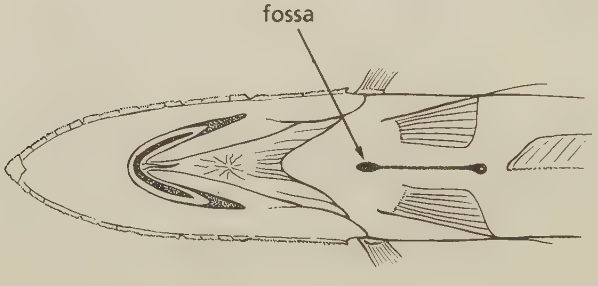


underside ***C. fasciatus*** Fig. 242

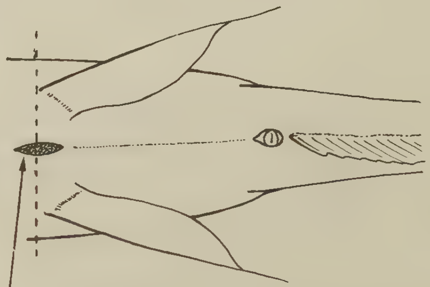


underside ***C. innotabilis*** Fig. 243

Group III (page 130): Black fossa of light organ large, single, and far removed from anus, with little external evidence of a connection between the two; anterior end of fossa distinctly in advance of a line between pelvic fin bases; anus (usually) immediately before anal fin origin or separated from origin by 1 to 3 scale rows. Examples:

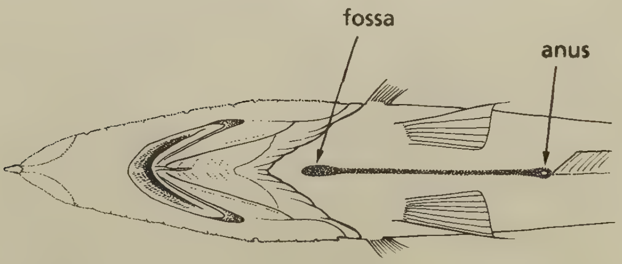


underside **C. jordani** Fig. 244
(after Okamura, 1970b)

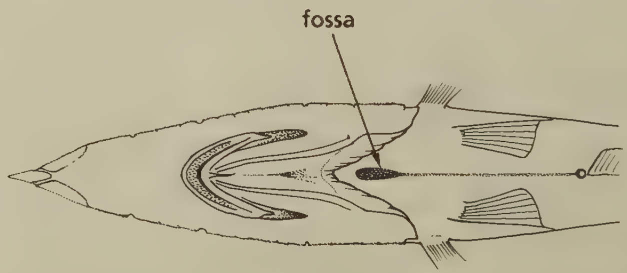


fossa extends forward of pelvic fin origins underside Fig. 245

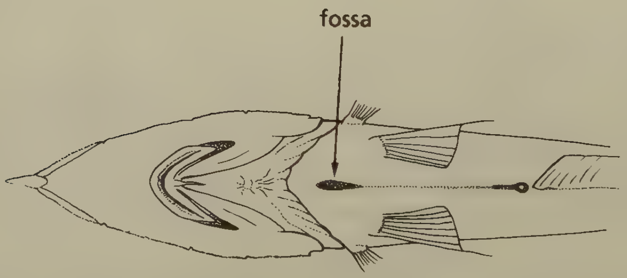
Group IV (page 133): Light organ externally evident as a broad blackish strip extending from the periproct to just behind the isthmus, the strip dilated at each end; anus immediately before anal fin. Examples:



underside **C. multispinulosus** Fig. 246
(after Okamura, 1970b)



underside **C. longissimus** Fig. 247
(after Okamura, 1970b)



underside **C. hubbsi** Fig. 248
(after Okamura, 1970b)

Species within Groups :

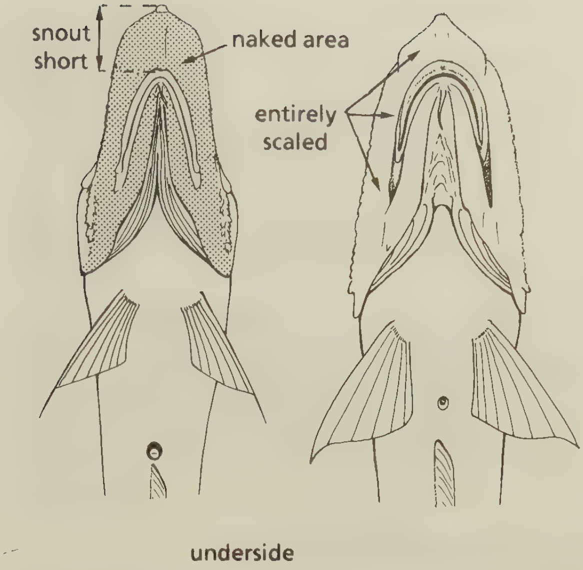
GROUP I :

1a. Snout short and blunt

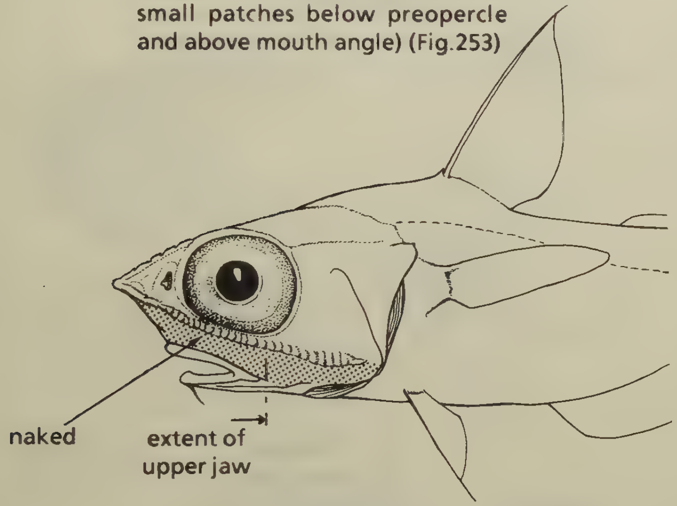
- **2a.** Underside of head naked (Fig. 249a) .... *C. aconcagua* (Fig. 250)
- **2b.** Underside of head scaled (Fig. 249b)
    - **3a.** Mouth large, upper jaw extends to posterior 1/3 of orbit .... *C. matamua* (Fig. 251)
    - **3b.** Mouth small, upper jaw extends to below midorbit at most .... *C. abditilux* (Fig. 252)

1b. Snout long and sharply pointed

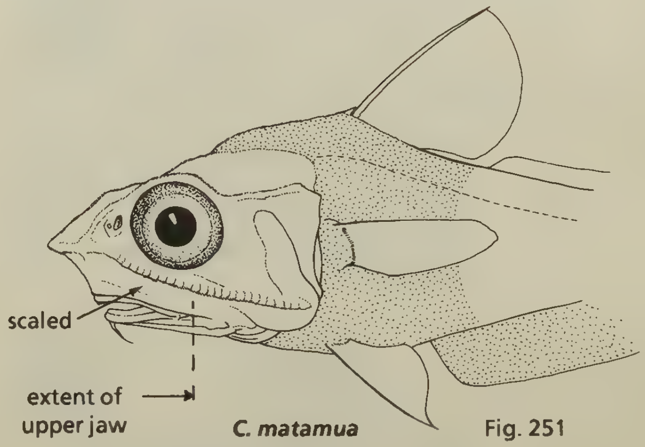
- **4a.** Underside of head essentially entirely naked (sometimes with small patches below preopercle and above mouth angle) (Fig.253)


snout short
naked area
entirely scaled
underside

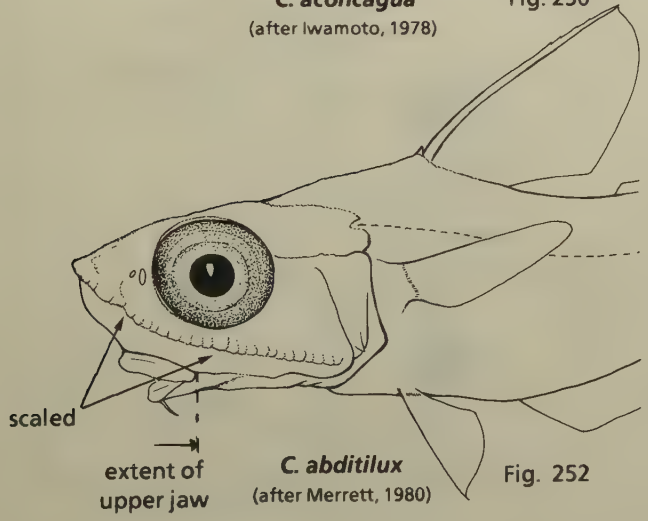
a. ***C. aconcagua*** (after Iwamoto, 1978) **b.** ***C. matamua*** (after Iwamoto, in Smith & Heemstra, 1986) Fig. 249


naked
extent of upper jaw

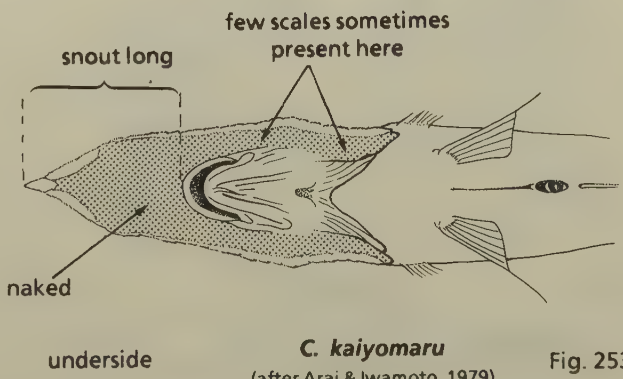
C. aconcagua (after Iwamoto, 1978) Fig. 250


scaled
extent of upper jaw

C. matamua (after Iwamoto, in Smith & Heemstra, 1986) Fig. 251


scaled
extent of upper jaw

C. abditilux (after Merrett, 1980) Fig. 252


snout long
few scales sometimes present here
naked
underside

C. kaiyomaru (after Arai & Iwamoto, 1979) Fig. 253

5a. Orbit marked with distinct black rim

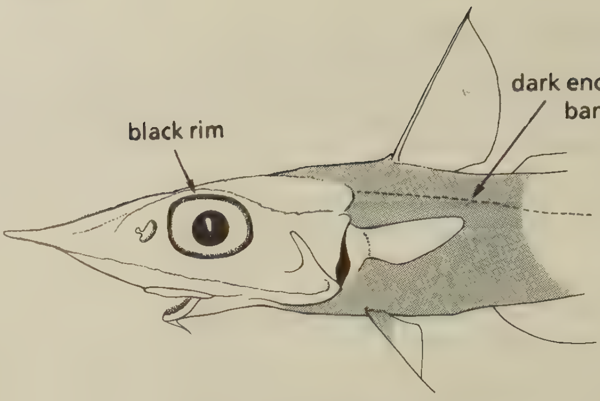
6a. Trunk completely encircled by a broad dark band; body scales with median spinule row scarcely if at all larger than the slightly divergent lateral rows, the rows immediately adjacent to the median row complete and extending to scale margin (Fig.255a) ..... ***C. kaiyomaru*** (Fig. 254)

6b. Trunk not encircled by a dark band; body scales with median spinule row much larger than the parallel lateral rows, the two or more rows adjacent to the median row foreshortened, not reaching scale margin (Fig. 255b) .... ***C. labiatus*** (Fig. 256)

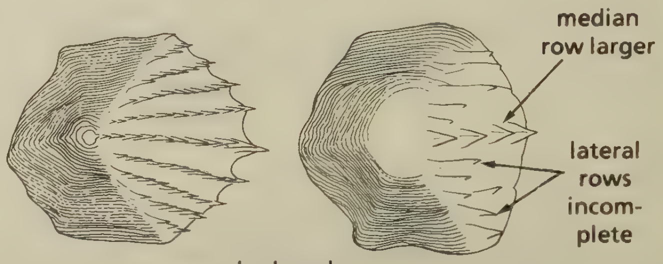
5b. Orbit without a blackish rim

7a. Scales atop head with spinules mostly in a single comblike row (Fig.257a); orbit diameter distinctly greater than postorbital length; orbit 1.7 to 1.8 times in snout length; scale rows below second dorsal fin origin 5.5 to 7 .... ***C. gilberti*** (Fig. 258)

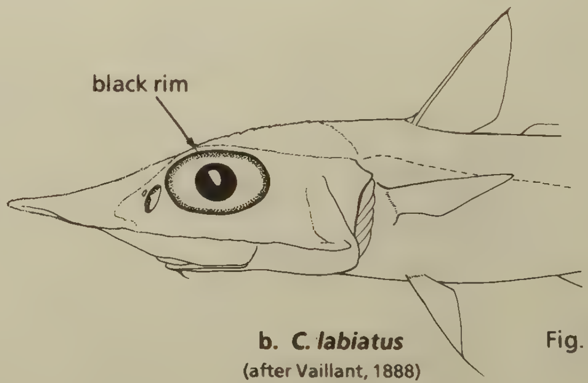
7b. Scales atop head with spinules in multiple rows or scattered (Fig. 257b); orbit diameter variable, from less than to greater than postorbital length of head; orbit 0.9 to 2.0 or more times in snout length; scale rows below second dorsal fin origin 3.5 to 6


black rim
dark encircling band

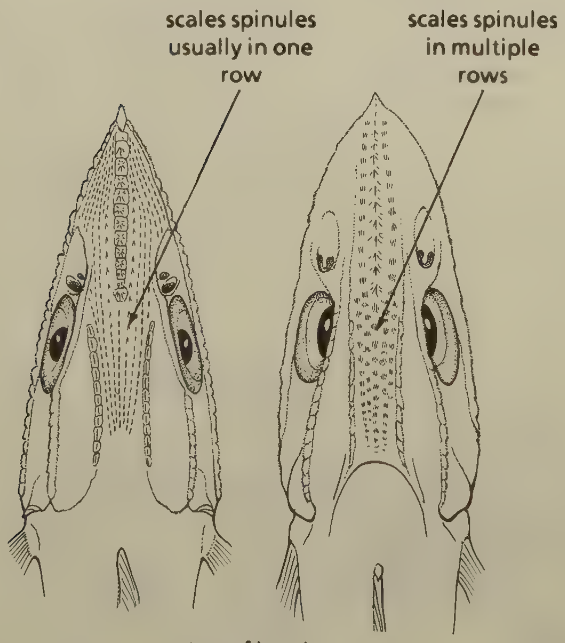
C. kaiyomaru
(after Arai & Iwamoto, 1979)
Fig. 254


median row larger
lateral rows incomplete
body scale

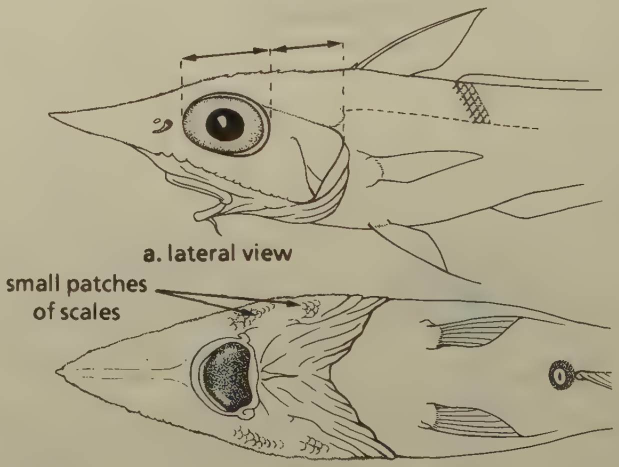
a. ***C. kaiyomaru*** (after Arai & Iwamoto, 1979)
b. ***C. labiatus*** (after Vaillant, 1888)
Fig. 255



b. ***C. labiatus***
(after Vaillant, 1888)
Fig. 256


scales spinules usually in one row
scales spinules in multiple rows
top of head

a. ***C. japonicus*** (after Okamura, 1970b)
b. ***C. weberi*** (after Gilbert & Hubbs, 1920)
Fig. 257


a. lateral view
small patches of scales

b. underside
C. gilberti
(after Okamura, 1970b)
Fig. 258

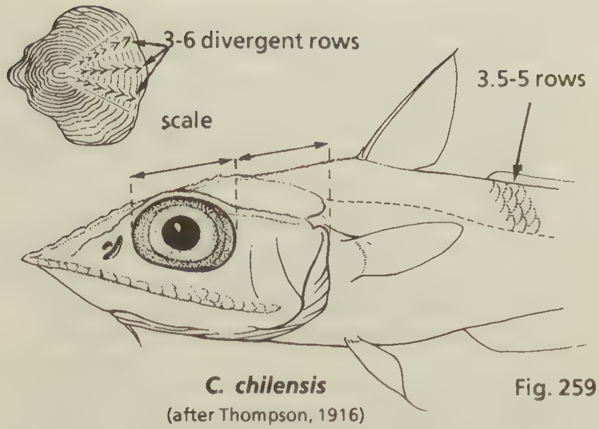
8a. Orbit diameter greater (1.03 to 1.39) than postorbital length of head; spinules on body scales in 3 to 6 divergent rows .... ***C. chilensis***
(Fig. 259)

8b. Orbit diameter equal to or (usually) shorter than postorbital length of head; spinules on body scales in 3 to 12 parallel or divergent rows

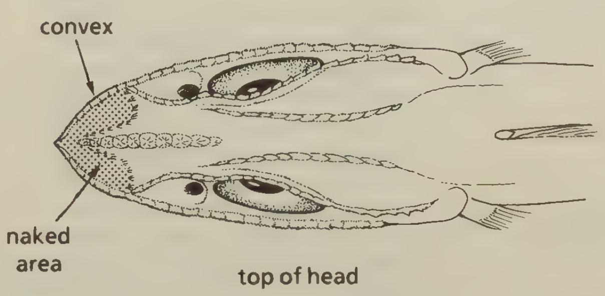
9a. Snout without an acuminate tip, its sides very convex; broad, naked areas dorsally behind anterolateral margins of snout (Fig.260); orbit 1.15 to 1.4 times in snout length

10a. Orbit 1.15 times in snout length; 4 to 7 parallel spinule rows on dorsal body scales .... ***C. acantholepis***
(Fig. 261)

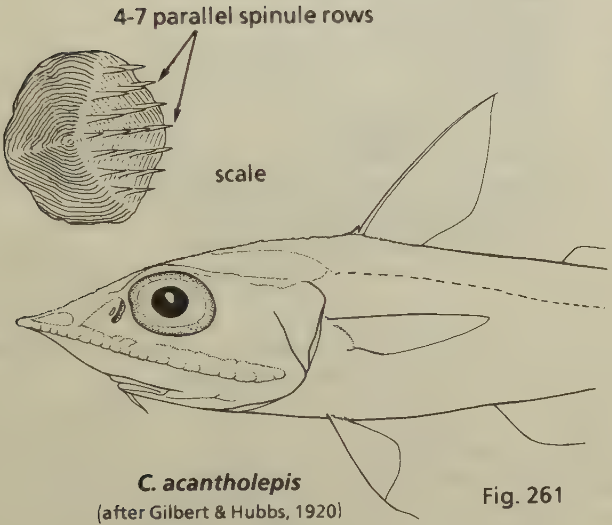
10b. Orbit about 1.4 times in snout length; 7 to 10 slightly divergent spinule rows on body scales .... ***C. carinifer***
(Fig. 262)


3-6 divergent rows
3.5-5 rows
scale

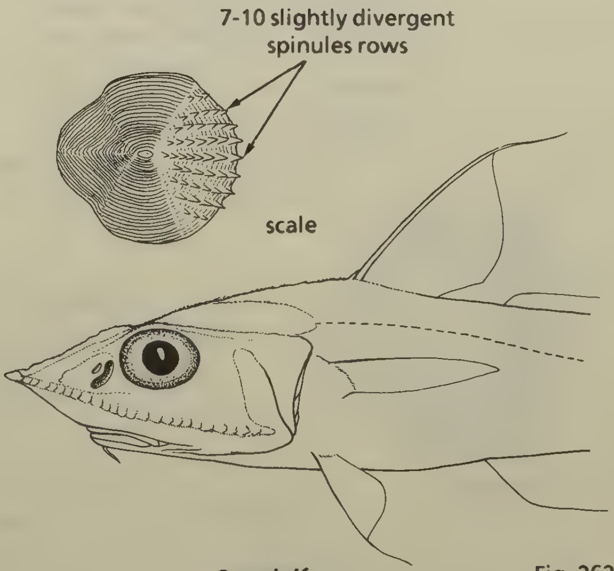
C. chilensis
(after Thompson, 1916)
Fig. 259


convex
naked area
top of head

C. acantholepis
(after Gilbert & Hubbs, 1920)
Fig. 260


4-7 parallel spinule rows
scale

C. acantholepis
(after Gilbert & Hubbs, 1920)
Fig. 261


7-10 slightly divergent spinules rows
scale

C. carinifer
(after Gilbert & Hubbs, 1920)
Fig. 262

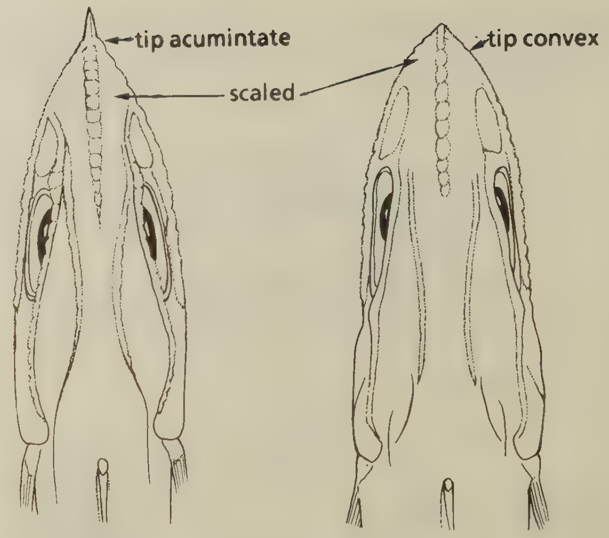
9b. Snout with its tip more or less acuminate, its sides mildly convex to nearly straight; areas dorsally behind anterolateral margins of snout mostly scaled (?naked in *C. doryssus*) (Fig.263); orbit 1.2 to 2.1 times in snout length*

11a. Orbit 1.2 to 1.7 times in snout length; body scales bearing 6 to 11 ridges of relatively small, weak spinules, the median spinule row very slightly larger than lateral rows .... ***C. radcliffei*** (Fig. 264)

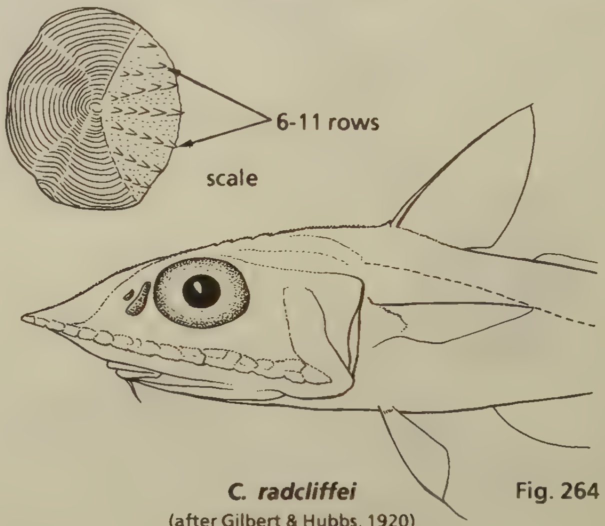
11b. Orbit 1.7 or more times in snout length; body scales bearing 3 to 13 ridges of strong spinules, the median spinule row slightly, to much larger than lateral rows

12a. Spinules on body scales (Fig.265 a,b) very strong, stout, 3-edged, each formed like a slightly folded triangular blade with the back of the fold forming an anteriorly facing keel (resulting in the "grooved" appearance described by Gilbert and Hubbs, 1920), the spinules tightly imbricate on each row and set at an angle of about 60 to 70 degrees from the horizontal; spinules in 5 to 8 parallel to slightly divergent rows, the median row much larger than lateral ones .... ***C. occa*** (Fig. 266)

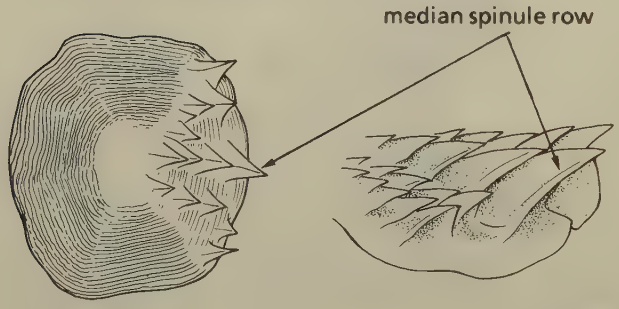
12b. Spinules on body scales strong but not "grooved" and widened at base, the spinules set at an angle of about 45 degrees from the horizontal; spinules in 3 to 13 parallel rows, the median row slightly to much stronger than the lateral ones



top of head (range of variation in shape)
C. radcliffei
(after Gilbert & Hubbs, 1920)
Fig. 263



C. radcliffei
(after Gilbert & Hubbs, 1920)
Fig. 264

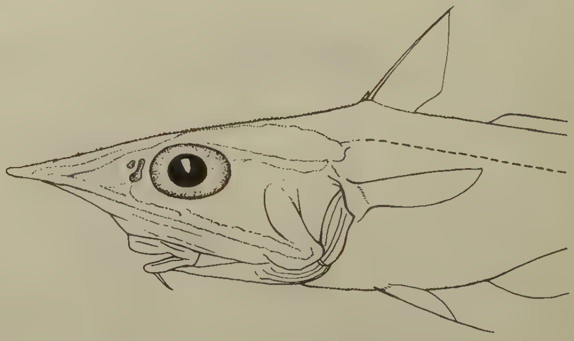


a. dorsal view

b. dorso-lateral view

body scale

C. occa
Fig. 265



C. occa
(after Parr, 1946)
Fig. 266

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* *C. innotabilis* and *C. karrerae* of Group II would fall in here if the light organ character was misinterpreted but these two species are easily distinguished by the many (10 to 13) rows of very small spinules on body scales, the median row of each scale not enlarged, and area behind anterolateral margins dorsally naked

13a. Orbit about 1.7 times in snout length; 3 to 5 spinule rows on body scales .. *C. aratrum* (Fig. 267)

13b. Orbit 1.9 or more times in snout length; 3 to 13 spinule rows on body scales

14a. Long spine of first dorsal fin about equal to postrostral length of head; 5 to 7 spinule rows on body scales, median ridge only slightly larger than adjacent rows .... *C. weberi* (Fig. 268)

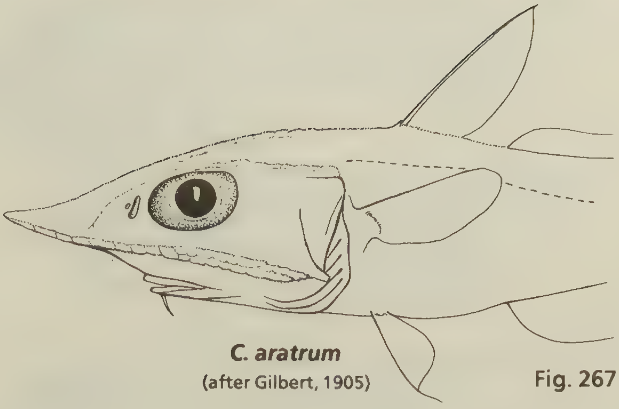
14b. Long spine of first dorsal fin decidedly less than postrostral length of head; 3 to 13 spinule rows on body scales, median ridge much stronger than adjacent ones .... *C. doryssus* (Fig. 269)

4b. Underside of head uniformly scaled

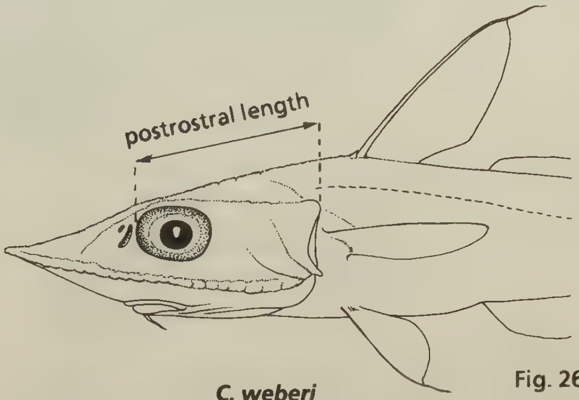
15a. Snout equal to or more than twice the length of orbit diameter

16a. Orbit 1.4 to 1.5 times in postorbital length of head; barbel long, about 2/3 of orbit diameter; nasal fossa scaled; spinules of body scales in widely divergent rows ... *C. macrorhynchus* (Fig. 270)

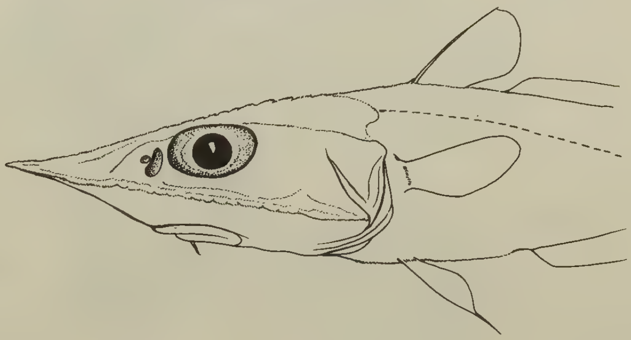
16b. Orbit 1.2 to 1.3 times in postorbital length; barbel less than 1/2 of orbit diameter; nasal fossa naked; spinules on body scales in parallel to slightly divergent rows



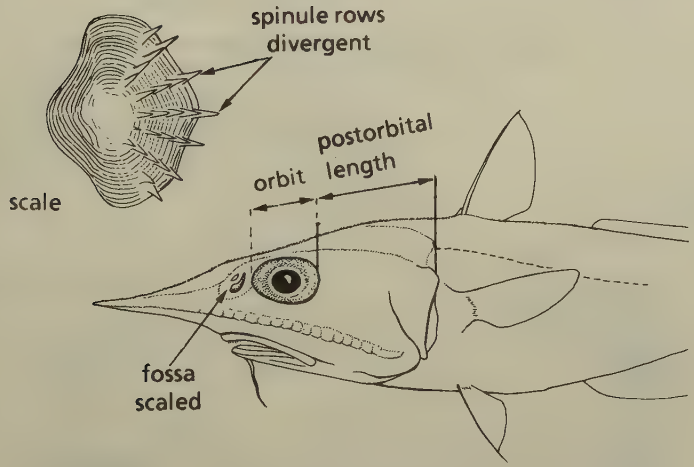
C. aratrum
(after Gilbert, 1905)
Fig. 267



C. weberi
(after Gilbert & Hubbs, 1920)
Fig. 268



C. doryssus
(after Gilbert, 1905)
Fig. 269



C. macrorhynchus
(after Radcliffe, 1912)
Fig. 270

17a. Interspace between dorsal fins less than base of first dorsal; 1 to 7 spinous keels on scales of interorbital space; spinules on body scales in 3 to 7 parallel rows .... ***C. quadricristatus*** (Fig. 271)

17b. Interspace between dorsal fins greater than base of first dorsal; a single spinous keel on scales of interorbital space; spinules on body scales in 1 to 5 parallel or somewhat divergent rows

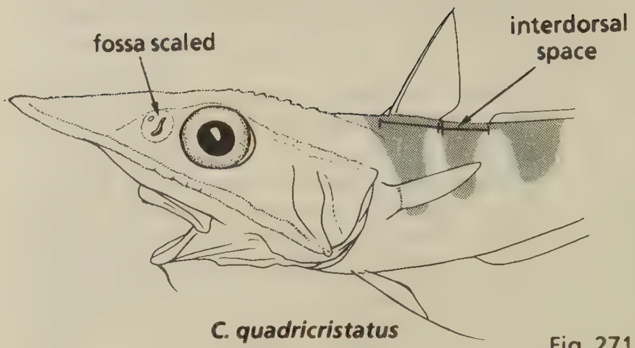
18a. Spinules on body scales in 3 to 5 parallel rows; barbel about 2.6 times in orbit diameter; interspace between dorsal fins about 1.4 times the base of first dorsal fin .... ***C. sparsilepis*** (Fig. 272)

18b. Spinules on body scales in 1 to 3 somewhat divergent rows; barbel about 6 times in orbit diameter; interspace between dorsal fins about 1.1 times the base of first dorsal fin .... ***C. spinifer*** (Fig. 273)

15b. Snout less than twice the orbit diameter

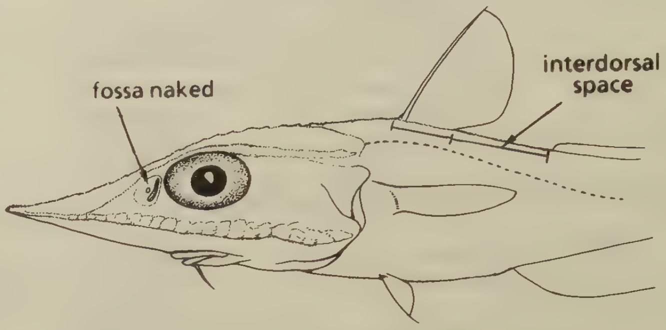
19a. Second spinous ray of first dorsal fin prolonged, its length much greater than postrostral length of head; scales over interorbital space with scattered isolated blade-like spinules, not arranged into keel-like rows .... ***C. braueri*** (Fig. 274)

19b. Second spinous ray of first dorsal fin shorter than postrostral length of head; scales over interorbital space with spinules arranged in distinct, usually keel-like rows


fossa scaled
interdorsal space

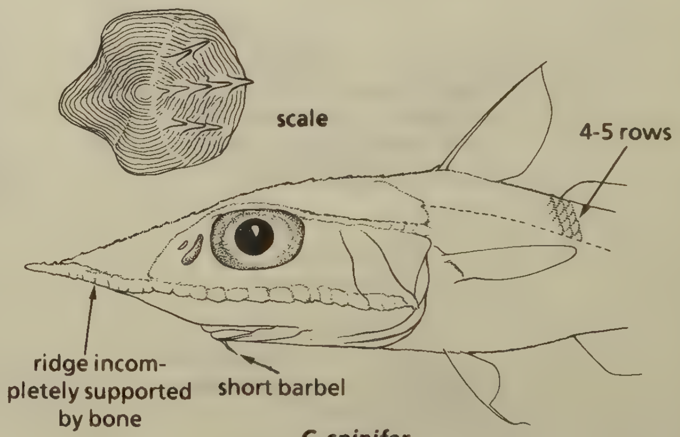
C. quadricristatus
(after Alcock, 1899)

Fig. 271


fossa naked
interdorsal space

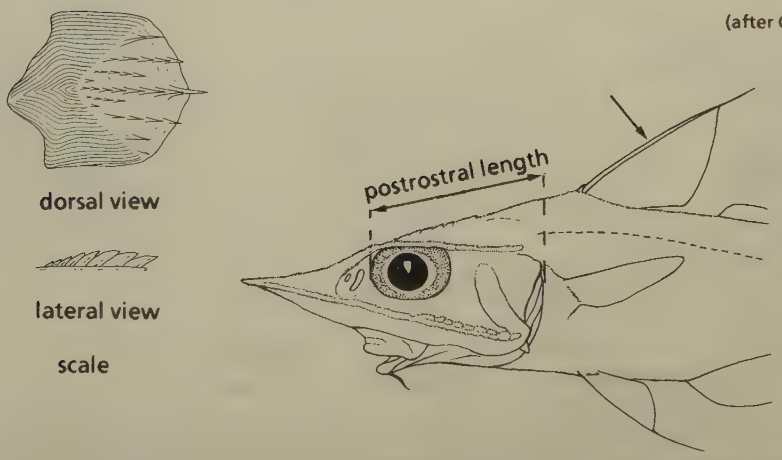
C. sparsilepis
(after Okamura & Kitajima, 1984)

Fig. 272


scale
4-5 rows
ridge incompletely supported by bone
short barbel

C. spinifer
(after Gilbert & Hubbs, 1920)

Fig. 273


dorsal view
lateral view
scale
postrostral length

C. braueri
(after Trunov, 1983)

Fig. 274

20a. Most scales between occipital ridges with spinules arranged in a single keel-like row

21a. Spinules on body scales in 3 to 6 parallel rows .... ***C. parallelus*** (Fig. 275)

21b. Spinules on body scales in 1 to 7 widely to somewhat divergent rows

22a. Snout relatively short and broad, about 1.3 times the orbit diameter; spinules on body scales in 5 to 7 widely divergent rows .... ***C. platorhynchus*** (Fig. 276)

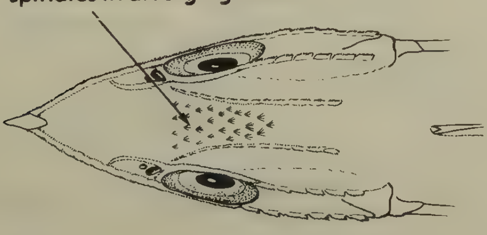
22b. Snout long and sharp, slightly less than twice the orbit diameter; spinules on body scales in 1 to 6 divergent, to somewhat divergent rows

23a. Anterolateral margin of snout completely supported by bone; scale rows below origin of second dorsal fin 5.5 to 7.5; barbel 2.1 to 3.9 times in orbit diameter ...... ***C. japonicus*** (Fig. 277)

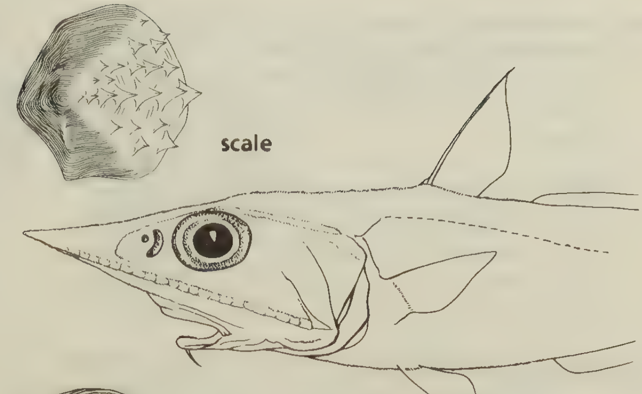
23b. Anterolateral margin of snout incompletely supported by bone; scale rows below origin of second dorsal fin 4.5; barbel about 6 times in orbit diameter .... ***C. spinifer*** (Fig. 273)

20b. Scales between occipital ridges with spinules arranged in 2 to 7 diverging rows (Fig.278)

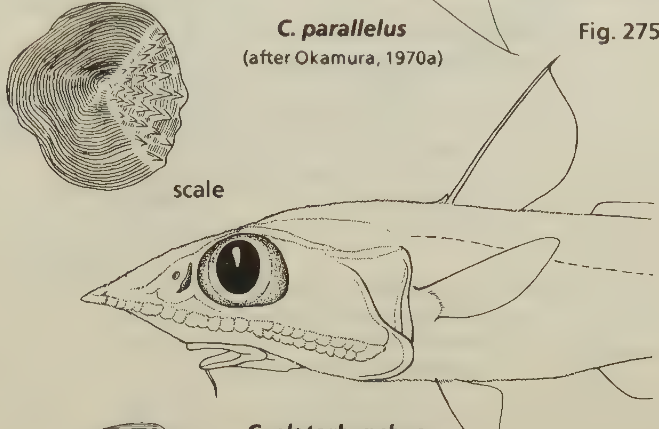
24a. Anterolateral margin of snout completely supported by bone; snout length 1.5 to 1.9 times the orbit diameter; interspace between dorsal fins 1.3 to 2.0 times the base of first dorsal .... ***C. smithi*** (Fig. 279)



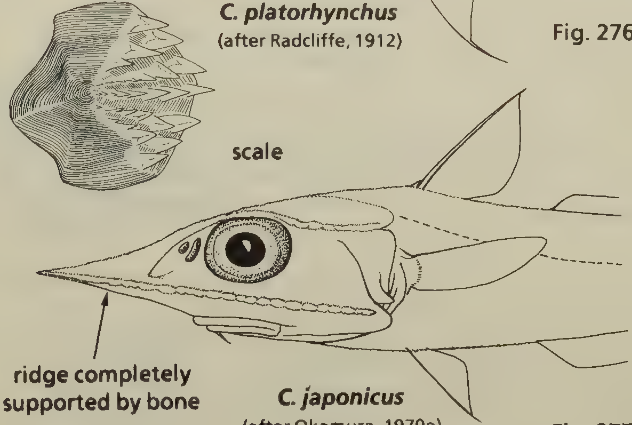
top of head
(after Okamura, 1970a) Fig. 278



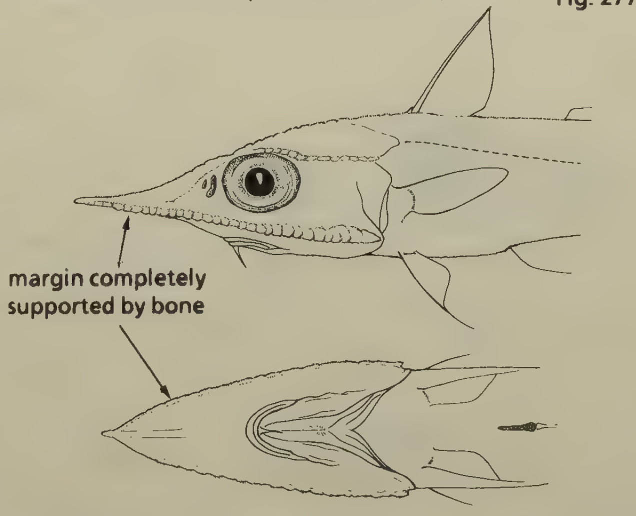
C. parallelus
(after Okamura, 1970a) Fig. 275



C. platorhynchus
(after Radcliffe, 1912) Fig. 276



C. japonicus
(after Okamura, 1970a) Fig. 277



C. smithi
(after Okamura, 1970a) Fig. 279

24b. Anterolateral margin of snout incompletely supported by bone; snout length 1.28 to 1.8 times the orbit diameter; interspace between dorsal fins 1.1 to 2.0 times the base of first dorsal

25a. Scales below second dorsal fin origin 6 to 7.5; orbit 1 to 1.2 times into postorbital length; spinules on body scales in parallel rows .... ***C. acanthiger*** (Fig. 280)

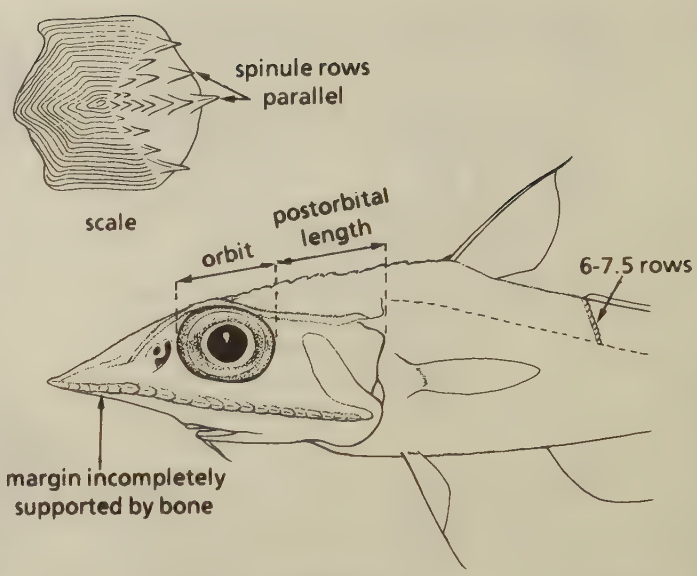
25 b. Scales below second dorsal fin origin 5 to 5.5; orbit 1.15 to 1.5 times into postorbital length; spinules on body scales in parallel or divergent rows

26a. Interspace between dorsal fins 2.0 times the base of first dorsal; snout 1.8 times the orbit diameter .... ***C. kermadecus*** (Fig. 281)

26b. Interspace between dorsal fins 1.1 to 1.2 times the base of first dorsal; snout 1.3 to 1.7 times the orbit diameter

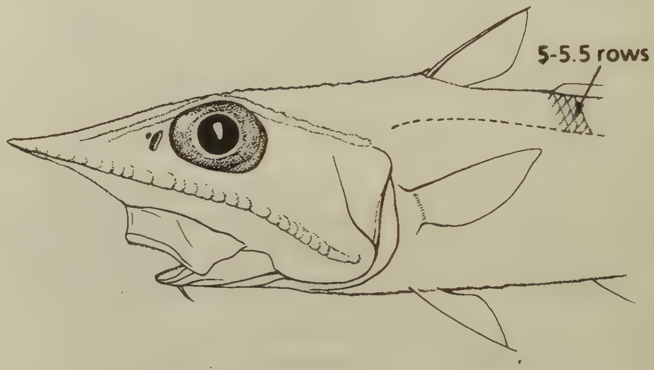
27a. Orbit diameter enters postorbital length of head 1.4 to 1.5 times .... ***C. divergens*** (Fig. 282)

27b. Orbit diameter enters postorbital length of head 1.15 to 1.3 times .... ***C. commutabilis*** (Fig. 283)



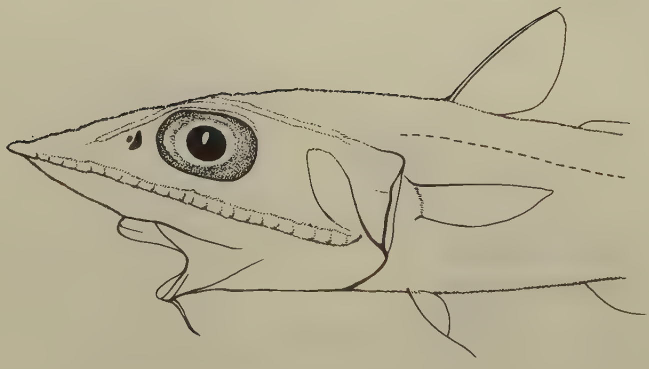
C. acanthiger
(after Iwamoto in Smith & Heemstra, 1986)

Fig. 280



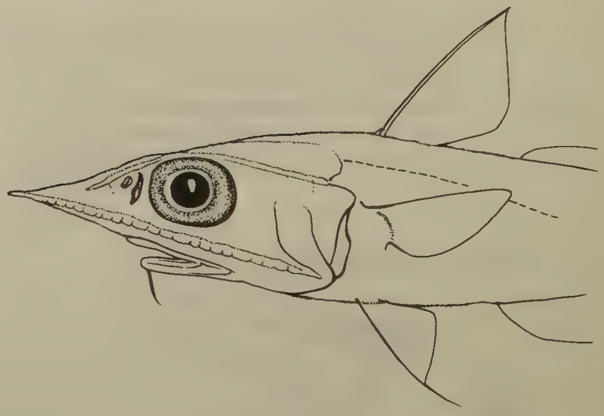
C. kermadecus
(after Günther, 1887)

Fig. 281



C. divergens
(after Okamura & Kitajima, 1984)

Fig. 282



C. commutabilis
(after Radcliffe, 1912)

Fig. 283

GROUP II :

1a. A prominent blackish blotch, sometimes ocellated, above and behind pectoral fin base; anus slightly removed from anal fin; underside of snout naked; antero-lateral snout margin completely supported by bone

2a. Dorsal fin high, spinous second ray about as long as, or longer than, head length

3a. Dorsal snout profile straight or slightly convex, snout not especially long, about equal to or slightly longer than orbit diameter

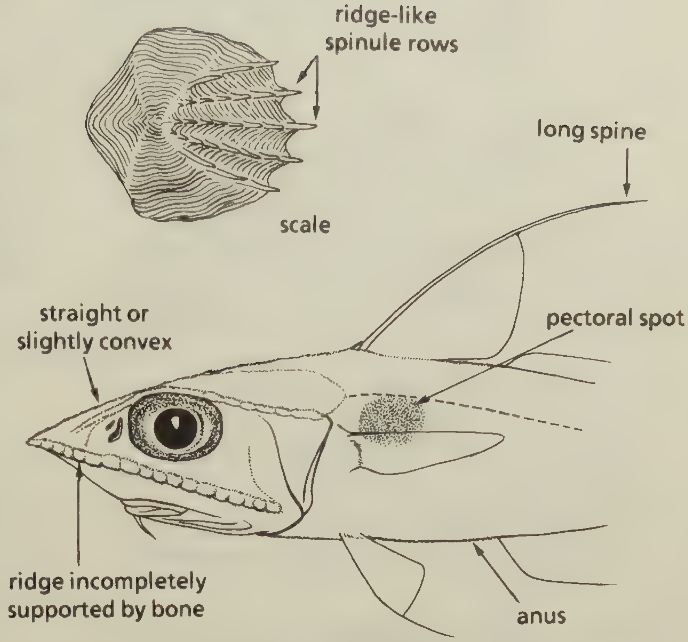
4a. Five or fewer strong spinous ridges on scales .... ***C. maculatus*** (Fig. 284)

4b. Five to 11 low ridges on scales ..... ***C. velifer*** (Fig. 285)

3b. Dorsal snout profile distinctly concave; snout length distinctly longer than orbit diameter

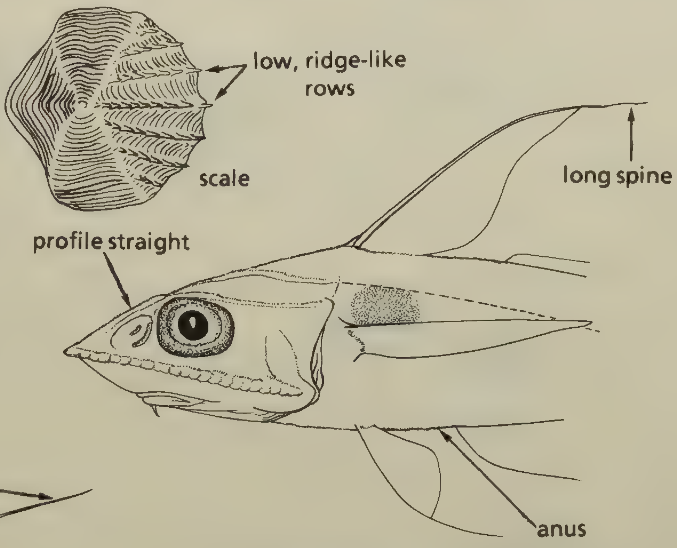
5a. Pectoral fin rays 14 or 15; pelvic rays 6; the 2 posterior saddlemarks rather indistinct ... ***C. sexradiatus*** (Fig. 286)

5b. Pectoral fin rays 16 or 17; pelvic rays 7; the saddlemarks prominent or rather indistinct


ridge-like spinule rows
long spine
scale
straight or slightly convex
pectoral spot
ridge incompletely supported by bone
anus

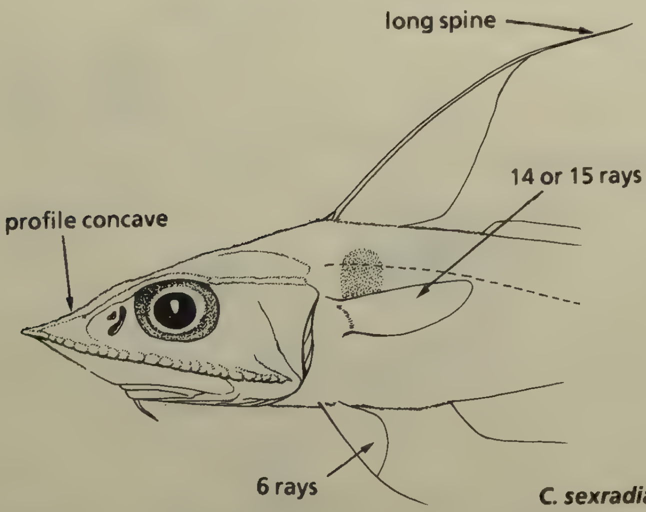
C. maculatus
(after Gilbert & Hubbs, 1920)

Fig. 284


low, ridge-like rows
scale
long spine
profile straight
anus

C. velifer
(after Gilbert & Hubbs, 1920)

Fig. 285


long spine
14 or 15 rays
profile concave
6 rays

C. sexradiatus
(after Gilbert & Hubbs, 1920)

Fig. 286

6a. Pectoral spot narrow, occupying 4 to 6 oblique scale rows; snout long, slender, sharply pointed, its length about 2.3 times in head length .... *C. triocellatus* (Fig. 287)

6b. Pectoral spot broad, occupying 6 to 8 oblique scale rows; snout shorter, broader, 2.4 to 2.7 times in head length

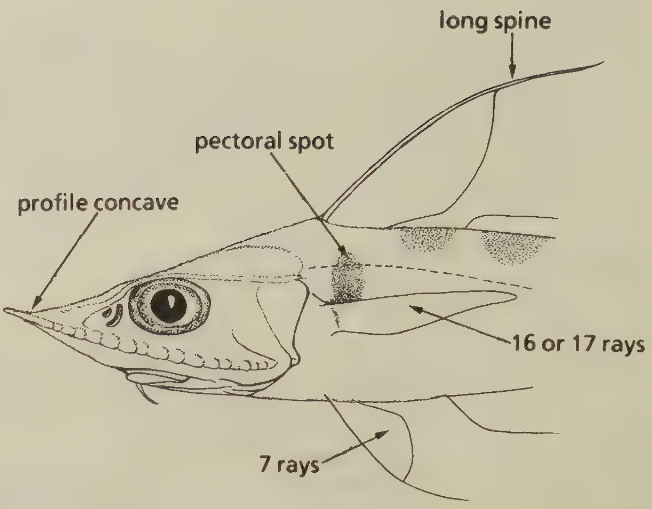
7a. Pectoral spot and saddles prominent; snout 2.7 times in head length .... *C. notatus* (Fig. 288)

7b. Pectoral spot and saddles rather indistinct; snout 2.4 times in head length .... *C. dorsalis* (Fig. 289)

2b. First dorsal height moderate, less than head length, usually about equal to postrostral length of head

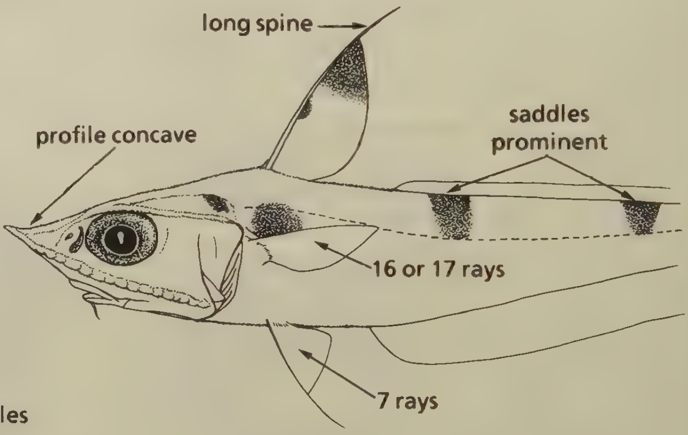
8a. Snout long and sharply pointed, the length 1.5 times or more the orbit diameter .... *C. argus* (Fig. 290)

8b. Snout moderate, terminal scute broad and blunt viewed dorsally


long spine
pectoral spot
profile concave
16 or 17 rays
7 rays

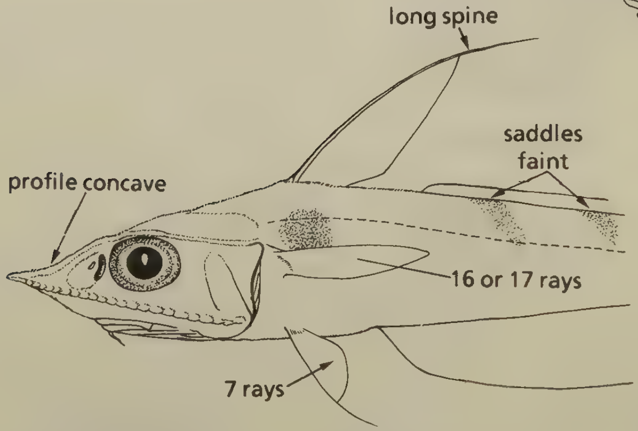
C. triocellatus
(after Gilbert & Hubbs, 1920)

Fig. 287


long spine
saddles prominent
profile concave
16 or 17 rays
7 rays

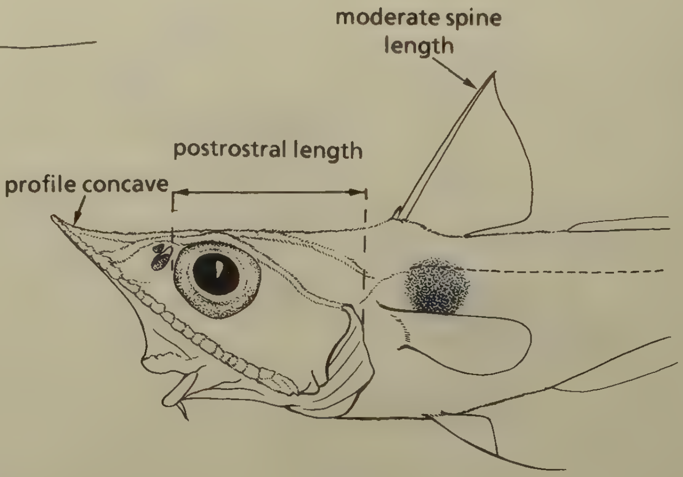
C. notatus
(after Radcliffe, 1912)

Fig. 288


long spine
saddles faint
profile concave
16 or 17 rays
7 rays

C. dorsalis
(after Gilbert & Hubbs, 1920)

Fig. 289


moderate spine length
postrostral length
profile concave

C. argus
(after Weber & de Beaufort, 1929)

Fig. 290

9a. Mouth cavity whitish .... ***C. kishinouyei*** (Fig. 291)

9b. Mouth cavity blackish .... ***C. macrolepis*** (Fig. 292)

1b. No blackish blotch behind pectoral base; saddles, bars or stripes in some

10a. Snout rather short and usually blunt, its length about equal to or much shorter than large orbit

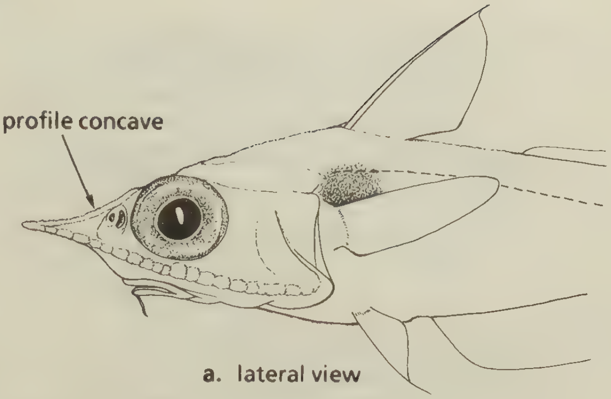
11a. Underside of head completely scaled

12a. No prominent markings on body; anus far removed from anal fin, about equidistant from pelvic fin bases and anal fin, or closer to pelvic fin bases; jaw teeth in 2 or 3 series .... ***C. macrochir*** (Fig. 293)

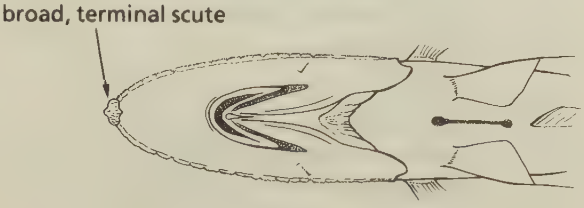
12b. Prominent bands, stripes or saddle markings on body; anus immediately before or slightly removed from anal fin, but decidedly closer to anal than to pelvic fin bases

13a. Banded pattern (sometimes faint) along entire trunk and tail, the diagonal bands extending down and forward .. ***C. aspercephalus*** (Fig. 294)

13b. Two prominent saddle marks or narrow longitudinal stripes on body

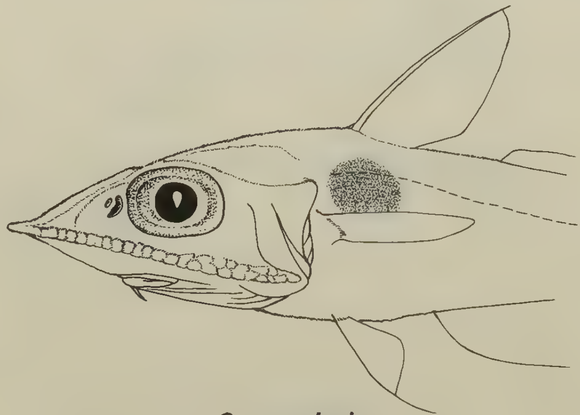


a. lateral view

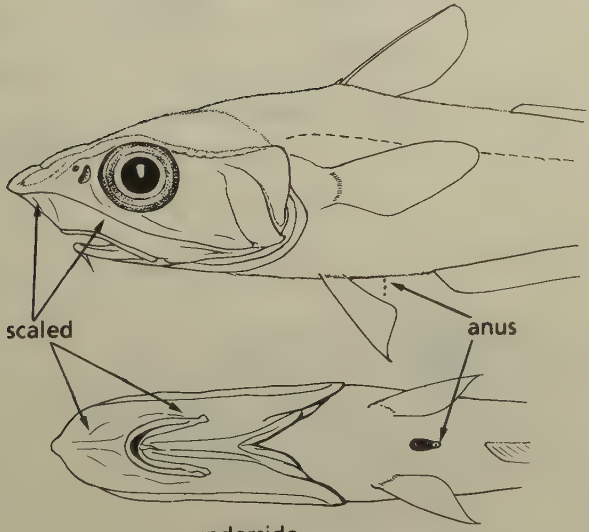


b. underside

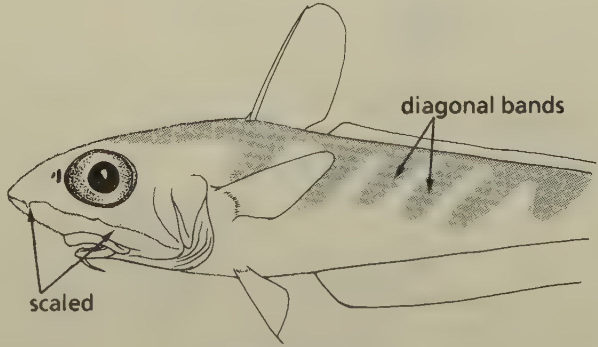
C. kishinouyei Fig. 291
(after Okamura, 1970a)



C. macrolepis Fig. 292
(after Gilbert & Hubbs, 1920)



underside
C. macrochir Fig. 293
(after Okamura, 1970a)



C. aspercephalus Fig. 294
(after Waite, 1911)

14a. Two prominent saddle marks on body, one on nape anterior to first dorsal fin, the other below anterior end of second dorsal fin .... ***C. biclinozonalis*** (Fig. 295)

14b. Fine longitudinal stripes along body .... ***C. australis*** (Fig. 296)

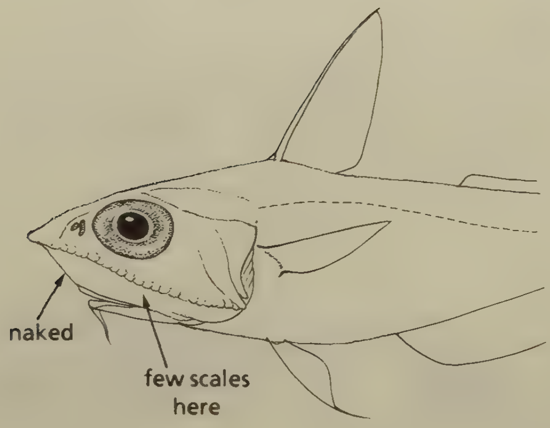
11b. Underside of head essentially completely naked (except for a small patch of scales above mouth angle in ***C. mirus*** and a second narrow patch on preopercle in ***C. bollonsi***)

15a. A small patch of scales above mouth angle extending posteriorly onto preopercle; no body markings .... ***C. mirus*** (Fig. 297)

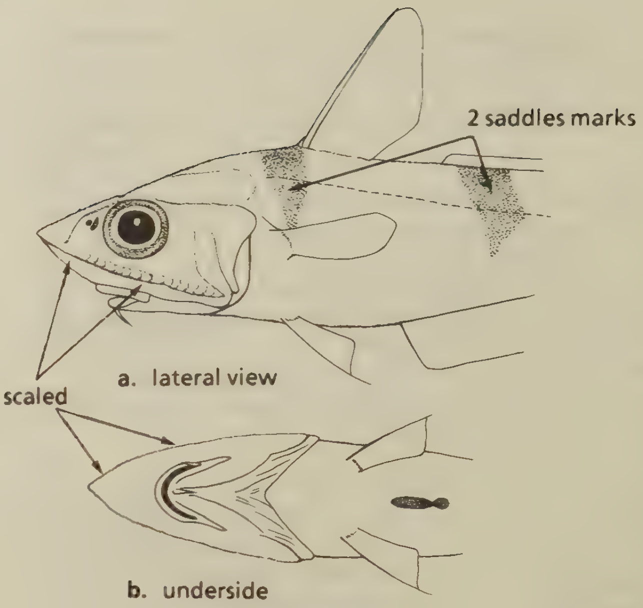
15b. Underside of head completely naked, or 2 small patches on each side; body markings present or absent

16a. No body markings in adults .... ***C. bollonsi*** (Fig. 298)

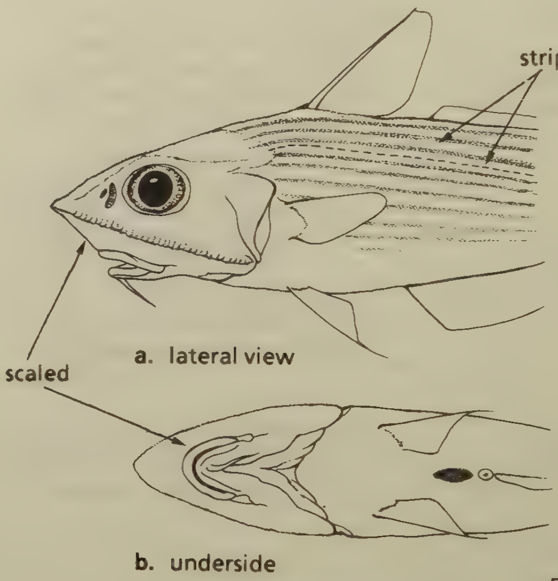
16b. Dark saddle marks on body


naked
few scales here

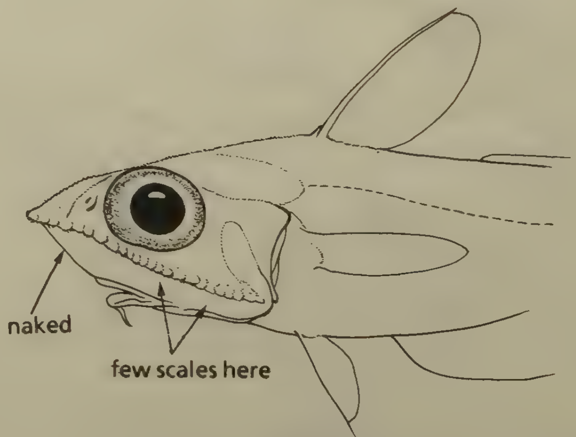
C. mirus
(after McCulloch, 1926)
Fig. 297


2 saddles marks
scaled
a. lateral view
b. underside

C. biclinozonalis
(after Arai & McMillan, 1982)
Fig. 295


stripes
scaled
a. lateral view
b. underside

C. australis
(after Arai & McMillan, 1982)
Fig. 296


naked
few scales here

C. bollonsi
(after McCann & McKnight, 1980)
Fig. 298

17a. Median row of predorsal scales with prominent enlarged spinule ridge ..... ***C. fasciatus*** (Fig.299)

17b. Median predorsal scales lacking large spinule rows .... ***C. cookianus*** (Fig. 300)

10b. Snout long and sharply pointed, its length more than 1.3 times the orbit diameter

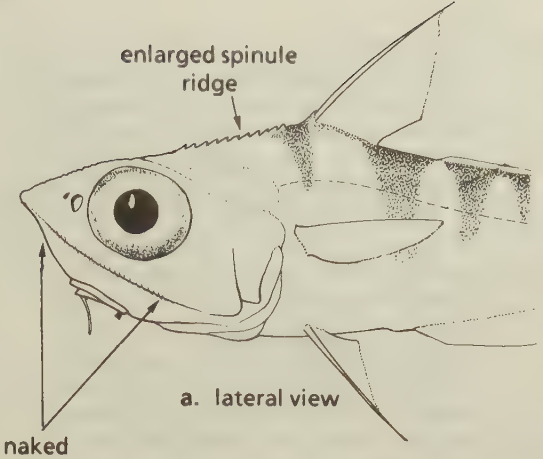
18a. Underside of head completely scaled

19a. Anterolateral snout margins completely supported by bone

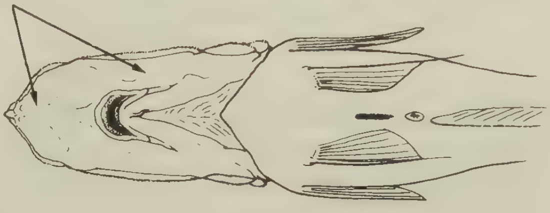
20a. Scales on top of head (between occipital ridges and most of snout) with a single sharp, keel-like ridge; scale rows below second dorsal fin 5.5 to 7.5 .... ***C. japonicus*** (Fig. 301)

20b. Scales on top of head with several diverging rows of high, bladelike spinules; scale rows below second dorsal fin 4.5 to 5.5 .... ***C. smithi*** (Fig. 302)

19b. Anterolateral snout margins incompletely supported by bone


enlarged spinule ridge
naked

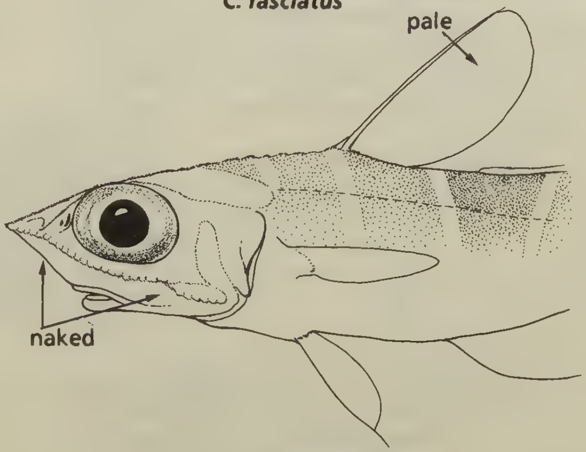
a. lateral view



b. underside

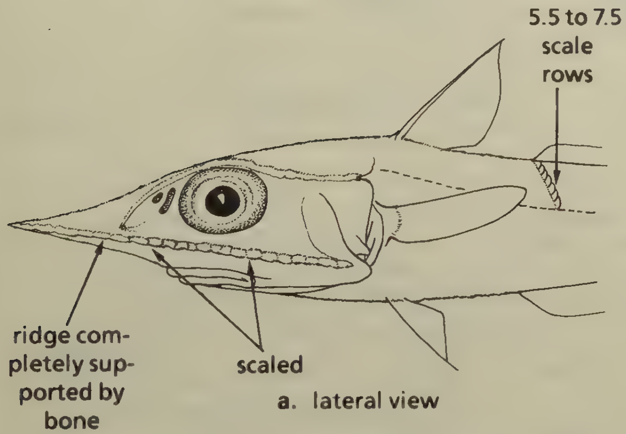
C. fasciatus

Fig. 299

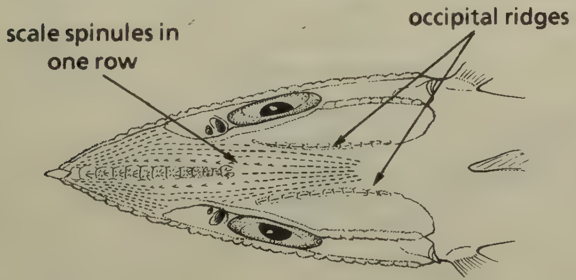


C. cookianus
(after McCann & McKnight, 1980)

Fig.300

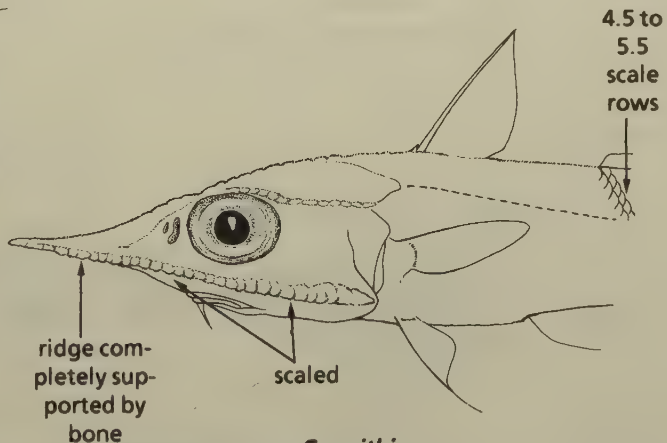

5.5 to 7.5 scale rows
ridge completely supported by bone
scaled

a. lateral view


scale spinules in one row
occipital ridges

b. top of head
C. japonicus
(after Okamura, 1970a)

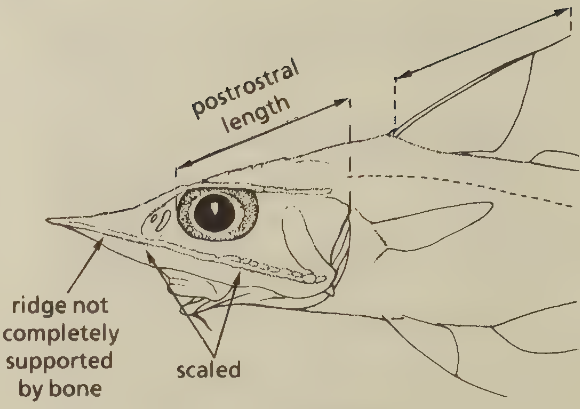
Fig. 301


4.5 to 5.5 scale rows
ridge completely supported by bone
scaled

C. smithi
(after Okamura, 1970a)

Fig. 302

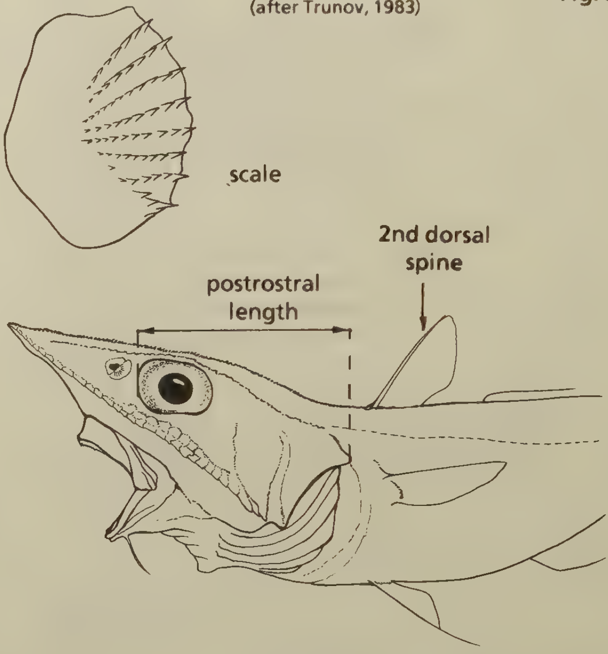
21a. Spinous second ray of first dorsal fin longer than postrostal length of head; upper jaw shorter than orbit diameter; scales on top of head with isolated, lanceolate spinules, not aligned into longitudinal series .... ***C. braueri***
(Fig. 303)


postrostral length
ridge not completely supported by bone
scaled

C. braueri
(after Trunov, 1983)

Fig. 303

21b. Spinous second ray of first dorsal fin shorter than postrostral length of head; upper jaw longer than orbit diameter; scales on top of head with small spinules closely adpressed and imbricate so as to form a long, serrated median longitudinal ridge and 0 to 2 shorter divergent ridges on either side of median ridge .... ***C. flabellispinis***
(Fig. 304)

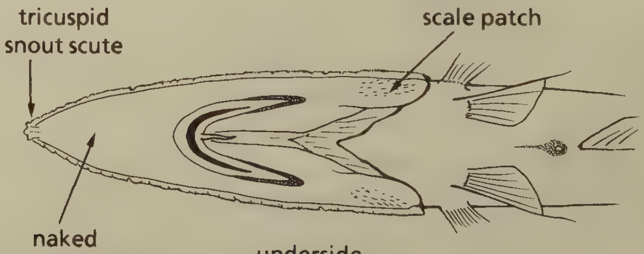

scale
2nd dorsal spine
postrostral length

C. flabellispinis
(after Alcock, 1899)

Fig. 304

18b. Underside of head mostly naked (a small patch on preopercle or scattered small scales above mouth and posteriorly onto preopercle in some)

22a. Prominent vertical bars on body (indistinct in largest individuals of ***C. longicephalus***); terminal snout scute blunt and tricuspid; usually a small crescent-shaped patch of scales on ventral surface of preopercle (Fig.305)

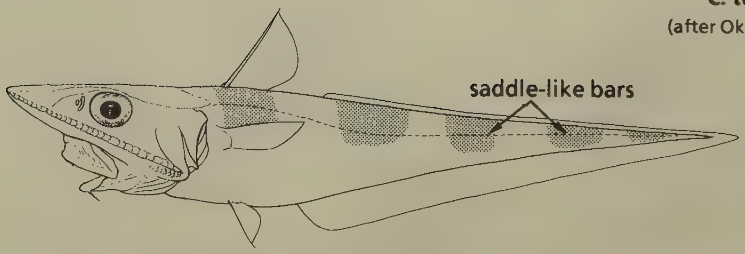

tricuspid snout scute
scale patch
naked

underside
C. tokiensis
(after Okamura, 1970b)

Fig. 305

23a. Snout long, 2.2 to 2.3 times in head length; orbits 4.6 to 4.9 times in head length, 2.0 to 2.2 times in snout length, 0.9 to 1.0 times in interorbital width .... ***C. longicephalus***
(Fig. 306)

23b. Snout 2.3 to 2.7 times in head length; orbits 3.7 to 4.6 times in head length, 1.4 to 1.9 times in snout length, 1.0 to 1.4 times in interorbital width


saddle-like bars

C. longicephalus
(after Okamura, Amaoka & Mitani, 1982)

Fig. 306

24a. Snout length 2.4 to 2.7 times in head length; orbit diameter 1.4 to 1.7 times in snout length; pectoral fin much longer than postorbital length of head .... ***C. hexfasciatus*** (Fig. 307)

24b. Snout length 2.3 to 2.5 times in head length; orbit diameter 1.7 to 1.9 times in snout length; pectoral fin about equal to postorbital length of head .... ***C. tokiensis*** (Fig. 308)

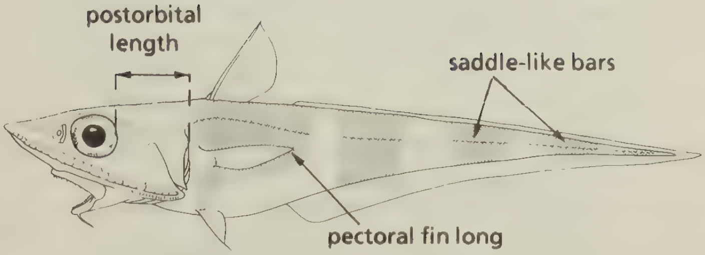
22b. Body without prominent vertical bars; terminal snout scute sharply pointed; underside of head naked or with small, scattered scales posteriorly

25a. Body scales with small spinules in 10 or more parallel rows in adults; interspace between dorsal fins decidedly less than length of first dorsal fin base; second dorsal fin almost as high anteriorly as anal fin

26a. Spinules on body scales slender, needle-like, distalmost ones projecting well beyond scale margin; orbit 1.2 to 1.3 times in snout length .... ***C. innotabilis*** (Fig. 309)

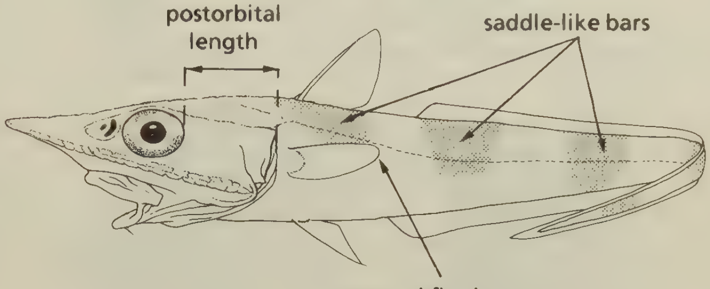
26b. Spinules on body scales short, low, bullet-shaped, distalmost ones little if at all projecting beyond scale margin; orbit 1.3 to 1.6 times in snout length .... ***C. karrerae*** (Fig. 310)

25b. Body scales with stout spinules in 3 to 11 divergent rows; interspace between dorsal fins more than length of first dorsal fin base; second dorsal fin rays much lower than anal fin rays


postorbital length
saddle-like bars
pectoral fin long

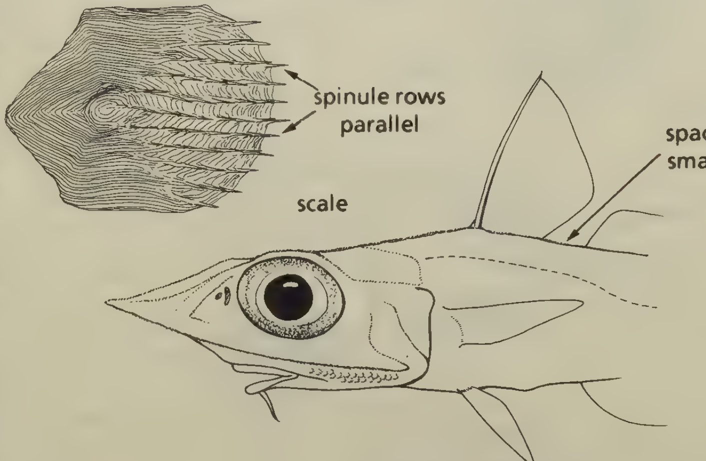
C. hexfasciatus
(after Okamura, Amaoka & Mitani, 1982)

Fig. 307


postorbital length
saddle-like bars
pectoral fin short

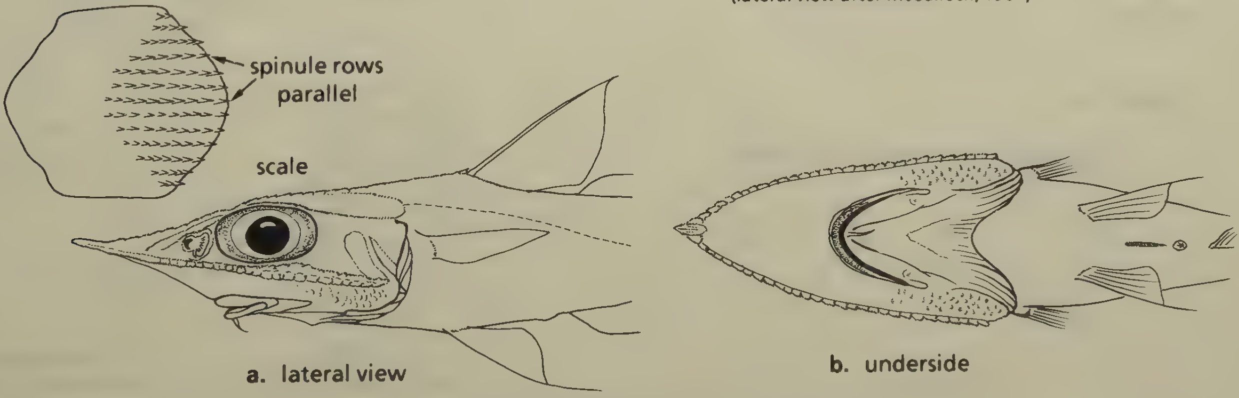
C. tokiensis
(after Okamura, 1970a)

Fig. 308


spinule rows parallel
scale
space small

C. innotabilis
(lateral view after McCulloch, 1907)

Fig. 309


spinule rows parallel
scale

a. lateral view

b. underside

C. karrerae (after Trunov, 1984)

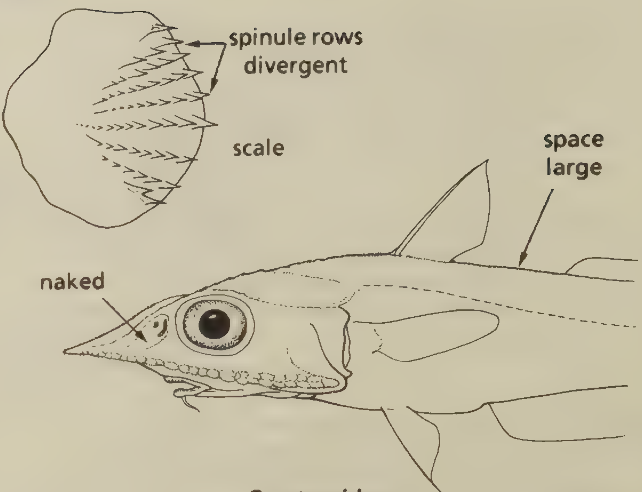
Fig. 310

27a. Nasal fossa naked; snout 38.5 to 41% of head length; barbel 34.5 to 50% of orbit diameter; pyloric caeca 40 to 50 .... *C. asteroides* (Fig. 311)
C. hige

27b. Nasal fossa scaled ventrally; snout 40 to 45.5% of head length; barbel 25 to 43% of orbit diameter; pyloric caeca 20 to 30

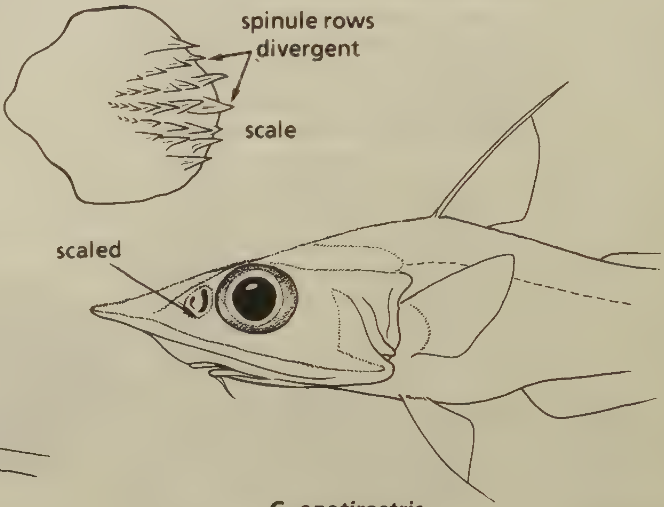
28a. Scales on body with broad, bladelike spinules in 4 to 10 divergent rows; snout length 40 to 43.5% of head length; upper jaw 25 to 27% of head length; barbel 33 to 43% of orbit diameter .... *C. anatirostris* (Fig. 312)

28b. Scales on body with relatively narrow spinules in 3 to 5 divergent rows; snout length 43.5 to 45.5% of head length; upper jaw 21.7 to 23.3% of head length; barbel 25 to 33.3% of orbit diameter .... *C. productus* (Fig. 313)


spinule rows divergent
scale
space large
naked

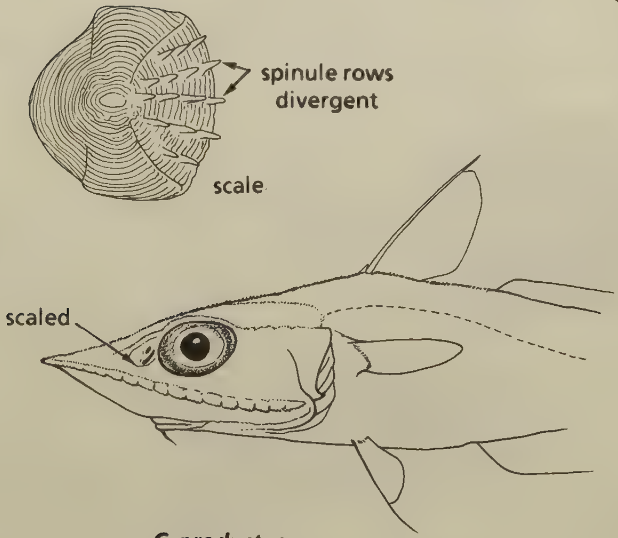
C. asteroides
(after Okamura, 1970a)

Fig. 311


spinule rows divergent
scale
scaled

C. anatirostris
(after Okamura, 1970a)

Fig. 312

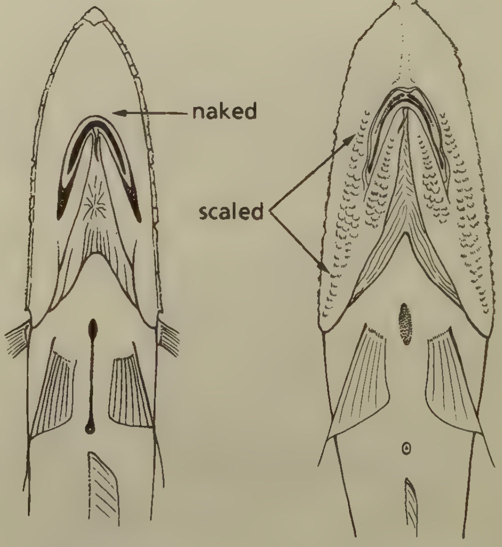

spinule rows divergent
scale
scaled

C. productus
(after Gilbert & Hubbs, 1916)

Fig. 313

GROUP III :

1a. Underside of head naked (Fig.314a)


naked
scaled

a. ***C. jordani***
(after Okamura, 1970a)

b. ***C. scaphopsis***
(after Iwamoto, 1978)

underside

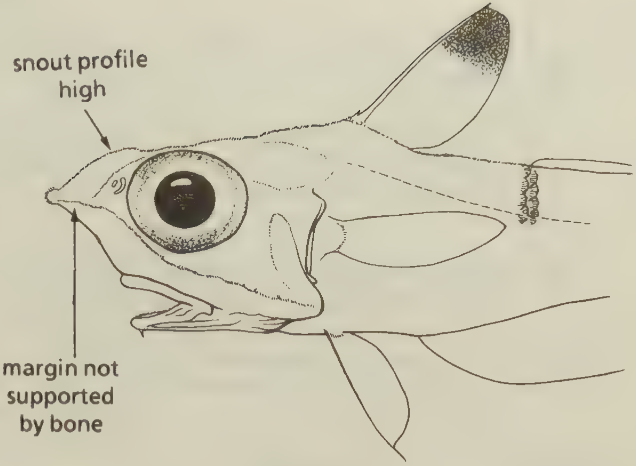
Fig. 314

2a. Snout rather bluntly pointed, its dorsal profile convex and highly arched (Fig.315); scales with 5 to 7 divergent rows of small spinules (Fig.316a); anterolateral margins of snout incompletely supported by bone (Fig.315, see also 317b) .... ***C. oliverianus*** (Fig. 315)

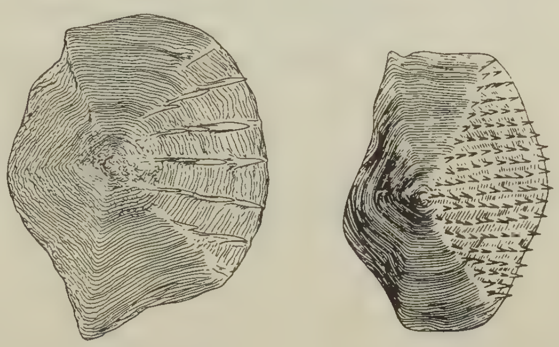
2b. Snout sharply pointed, its dorsal profile concave (Figs 318, 319); scales with 6 to 24 parallel or weakly divergent rows of small spinules (Fig.316b); anterolateral margins of snout completely supported by bone (Fig.317a)

- **3a.** Orbit large, about equal to snout and longer than postorbital length of head; pectoral spot large, about 2/3 of orbit diameter .... ***C. kishinouyei*** (Fig. 318)

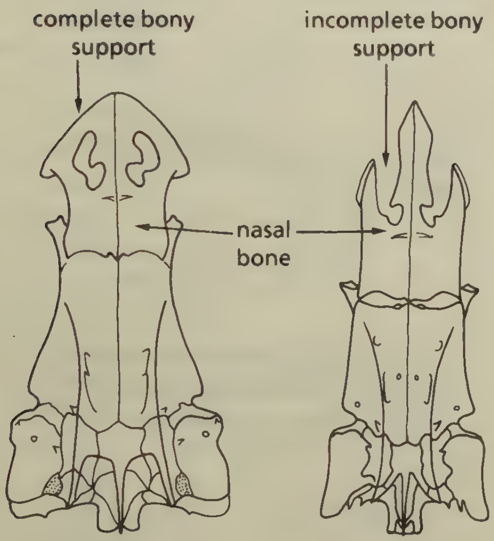
- **3b.** Orbit less than snout and postorbital length; pectoral spot small, often obscure and lacking in females .. ***C. jordani*** (Fig. 319)


snout profile high
margin not supported by bone

C. oliverianus Fig. 315

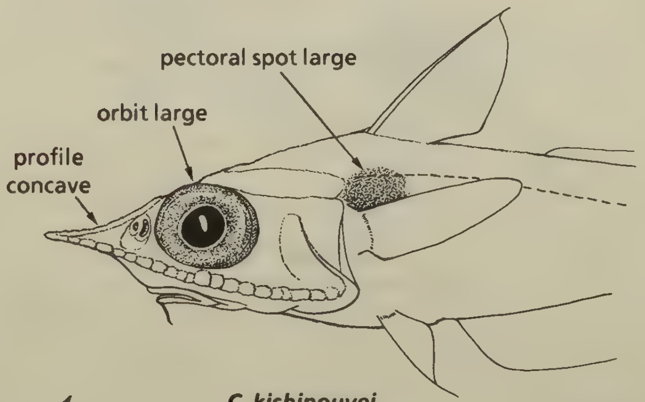


a. *C. oliverianus* **b. *C. jordani***
(from Okamura, 1970a)
scales Fig. 316

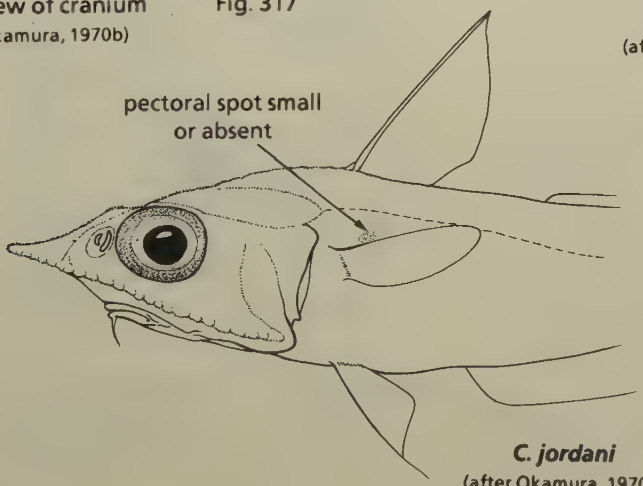

complete bony support
incomplete bony support
nasal bone

a. *C. kishinouyei* **b. *C. multispinulosus***

dorsal view of cranium Fig. 317
(from Okamura, 1970b)


pectoral spot large
orbit large
profile concave

C. kishinouyei
(after Okamura, 1970a) Fig. 318


pectoral spot small or absent

C. jordani
(after Okamura, 1970a) Fig. 319

1b. Underside of head mostly scaled (underside of snout naked in some) (Fig.314b)

4a. Median nasal ridge scales broad (Fig.320a); a narrow median strip of punctuations on underside of snout; a black median stripe connecting dorsal fins .. ***C. ventrilux*** (Fig. 321)

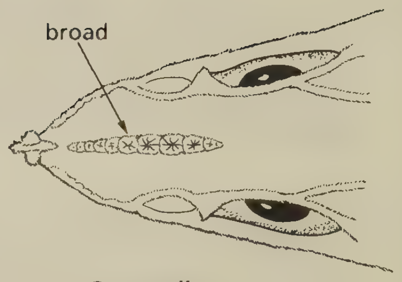
4b. Median nasal ridge scales narrow (Fig.320b,c); underside of snout and interdorsal space not marked by dark stripes

5a. Terminal snout scute elongated (Fig. 320b), the median prong much longer than the lateral ones .... ***C. caribbaeus*** (Fig. 322)

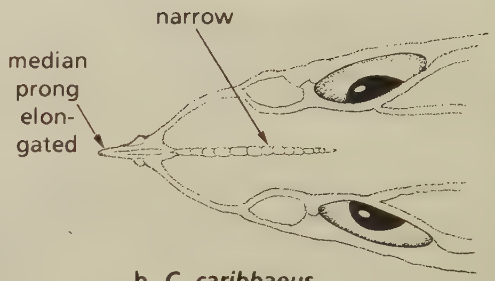
5b. Terminal snout scute distinctly 3-armed, the lateral arms about as long as the median arm (Fig.320c)

6a. Underside of snout completely naked

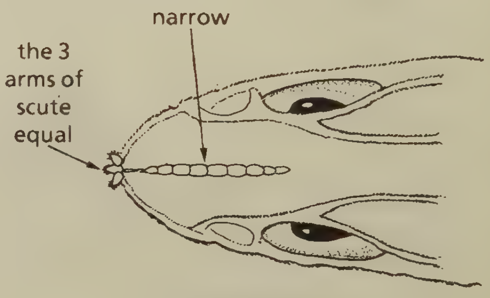
7a. Head covering thin, mostly transparent; head mostly naked or covered with thin, non-spinulated scales; base of tongue black anteriorly .... ***C. canus*** (Fig. 323)



a. *C. ventrilux*

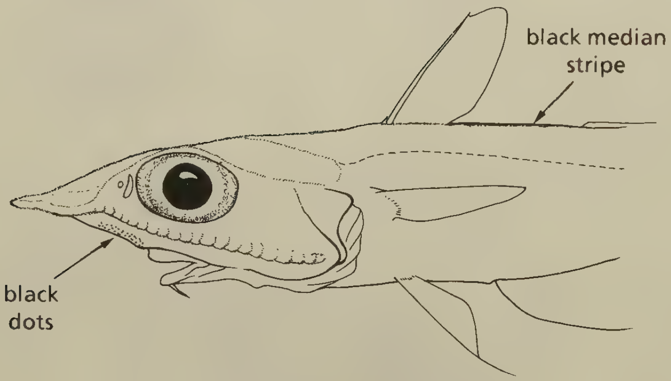

narrow
median prong elon- gated

b. *C. caribbaeus*


narrow
the 3 arms of scute equal

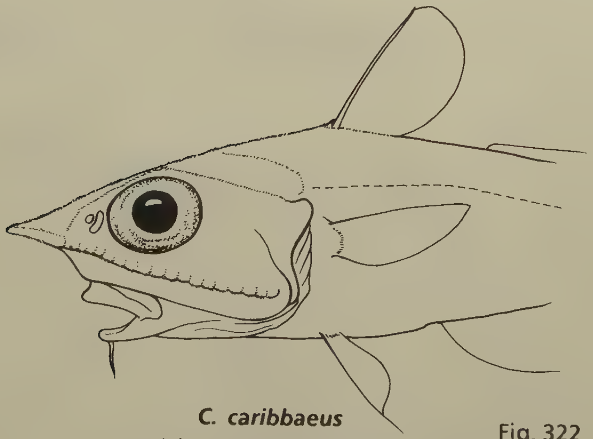
c. *C. coelorinchus*
top of head
(after Marshall & Iwamoto in Marshall, 1973)

Fig. 320


black median stripe
black dots

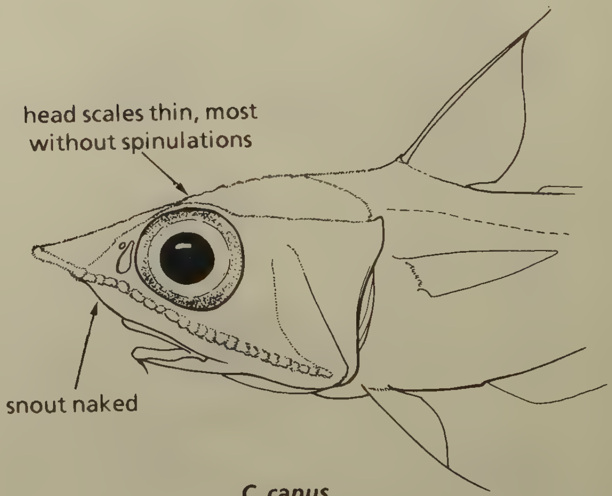
C. ventrilux
(after Marshall & Iwamoto in Marshall, 1973)

Fig. 321



C. caribbaeus
(after Goode & Bean, 1896)

Fig. 322


head scales thin, most without spinulations
snout naked

C. canus
(after Garman, 1899)

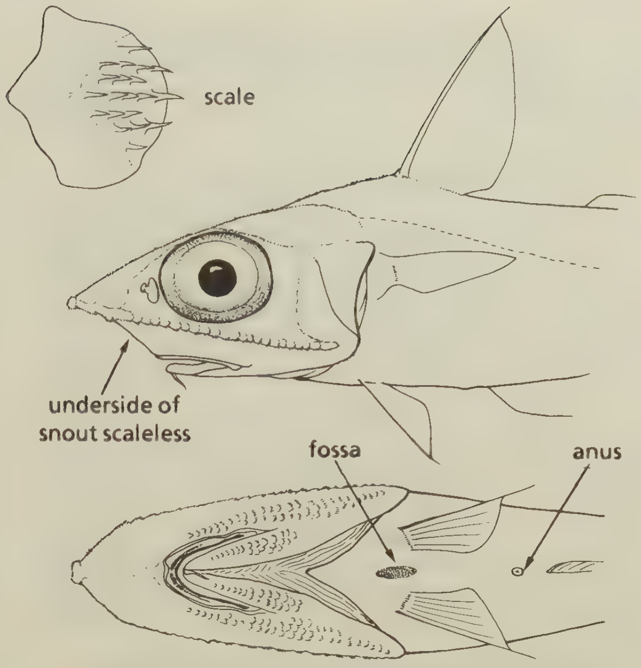
Fig. 323

7b. Head covering rather thick, opaque; head dorsally almost entirely covered with coarsely spinulated scales; entire floor of mouth pale .. ***C. scaphopsis*** (Fig. 324)

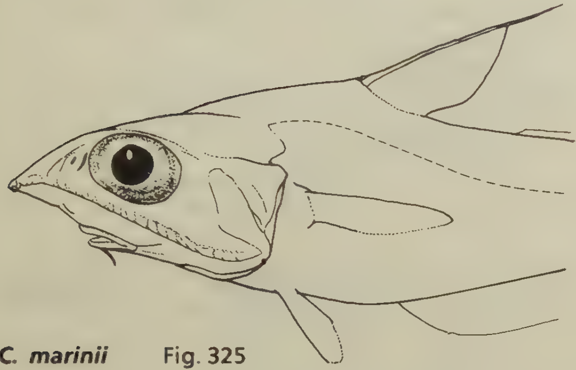
6b. Underside of snout mostly scaled, although often a narrow, naked median strip present

8a. Gillrakers on outer arch 10 to 13 total .... ***C. marinii*** (Fig. 325)

8b. Gillrakers on outer arch 10 or fewer .... ***C. coelorinchus*** (Fig. 326)


scale
underside of snout scaleless
fossa
anus

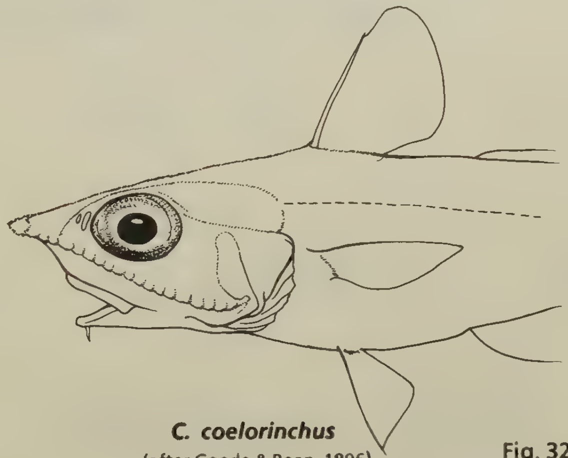
underside ***C. scaphopsis*** (after Iwamoto, 1978) Fig. 324



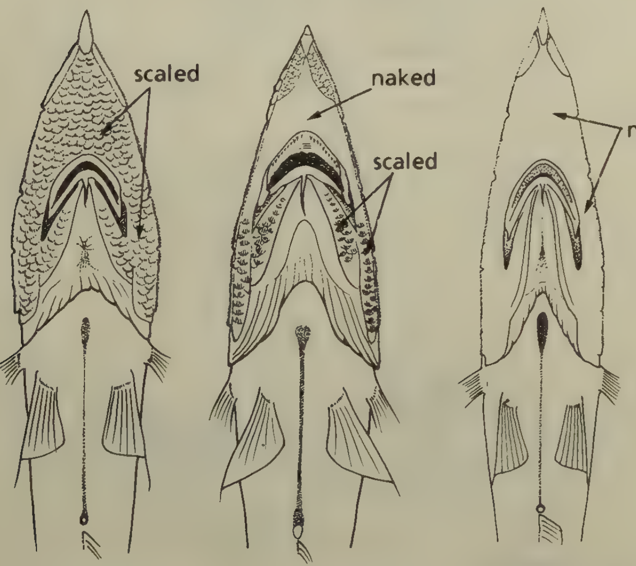
C. marinii Fig. 325

GROUP IV :

1a. Underside of head completely or almost completely scaled (Fig 327a,b)



C. coelorinchus (after Goode & Bean, 1896) Fig. 326


scaled
naked
scaled
naked

a. *C. quincunciatus* **b. *C. formosanus*** **c. *C. longissimus***

underside (after Okamura, 1970b) Fig. 327

2a. Posterior portion of underside of head from above and behind mouth angle scaled (Fig. 327b) .... ***C. formosanus*** (Fig. 328)

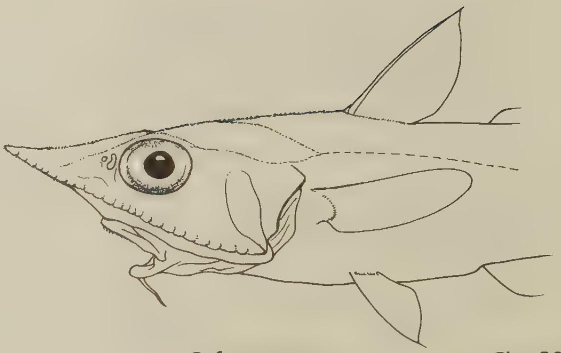
2b. Entire underside of head scaled (Fig.327a)

3a. Mandibular rami completely scaled(Fig. 327a); snout 2.3 to 2.55 times in head length; orbit 1.3 to 1.7 times in postorbital length of head; upper jaw 3.3 to 3.7 times in head length; pyloric caeca 8 to 11 .... ***C. quincunciatus*** (Fig. 329)

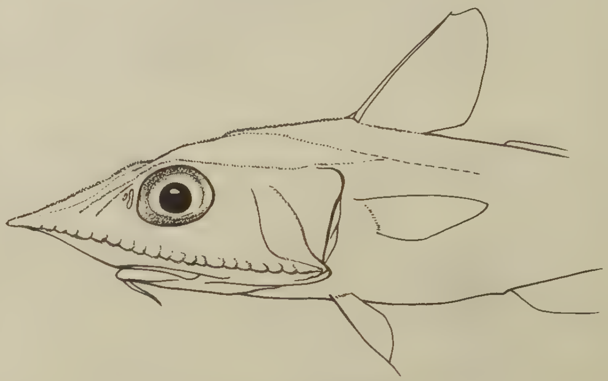
3b. Mandibular rami generally not scaled anteriorly; snout 2.1 to 2.2 times in head length; orbit 1.05 to 1.2 times in postorbital length of head; upper jaw 4.05 to 4.35 times in head length; pyloric caeca 14 to 22 ...... ***C. thompsoni*** (Fig. 330)

1b. Underside of head completely naked (Fig. 327c)

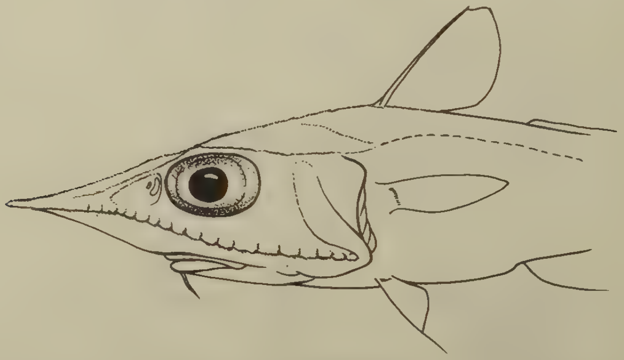
4a. Anterolateral margin of snout completely supported by bone (Fig.331a) .. ***C. acutirostris*** (Fig. 332)



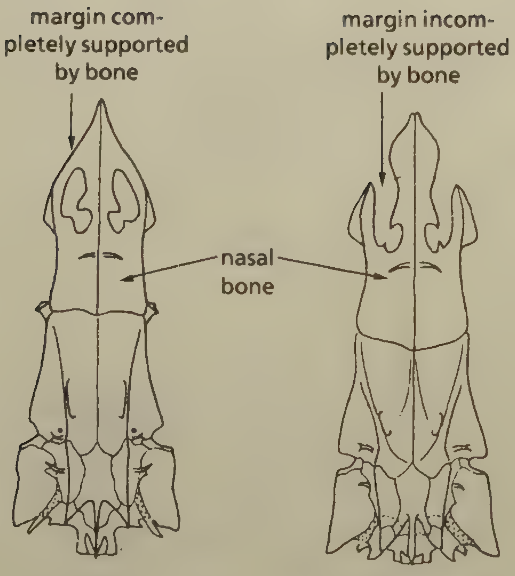
C. formosanus Fig. 328
(after Okamura, 1970a)



C. quincunciatus Fig. 329
(after Gilbert & Hubbs, 1920)

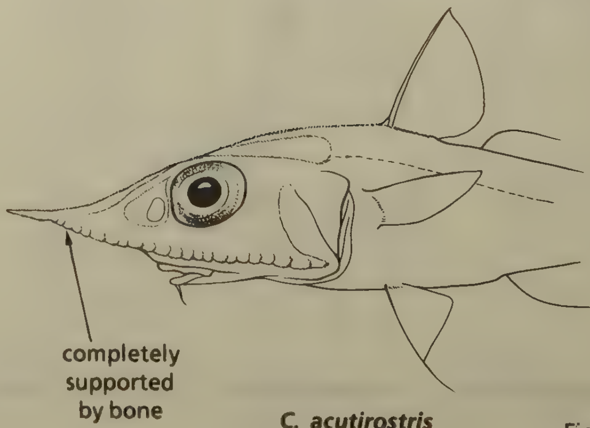


C. thompsoni Fig. 330
(after Gilbert & Hubbs, 1920)


margin completely supported by bone
margin incompletely supported by bone
nasal bone

a. *C. smithi* b. *C. gilberti*

dorsal view of cranium
(after Okamura, 1970b) Fig. 331


completely supported by bone

C. acutirostris Fig. 332
(after Radcliffe, 1912)

4b. Anterolateral margin of snout incompletely supported by bone (Fig.331b)

5a. A prominent, round pectoral blotch present (Fig.333); subopercle prolonged posteroventrally into a distinct narrow flap (Figs 333, 334)

6a. Snout 1.9 times in head length; orbit 4.6 to 4.9 times in head length; upper jaw less than orbit diameter, 4.7 to 5.2 times in head length; mouth pale ...... ***C. gladius*** (Fig. 333)

6b. Snout 2.1 to 2.7 times in head length; orbit 3.5 to 4.1 times in head length; upper jaw about equal to orbit diameter, 3.7 to 4.6 times in head length; mouth greyish .... ***C. matsubarai*** (Fig. 334)

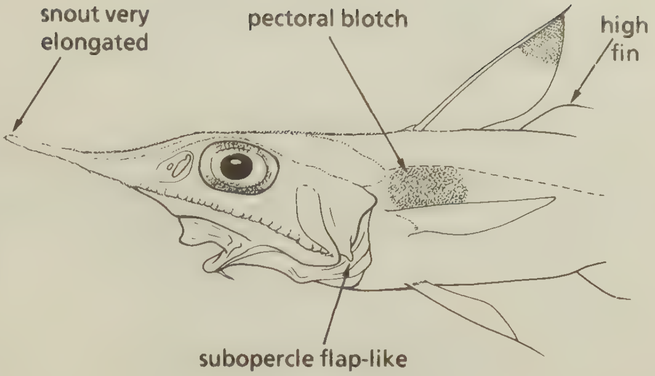
5b. No pectoral blotch; subopercle prolonged into a short flap or not prolonged

7a. Upper jaw distinctly longer than orbit diameter

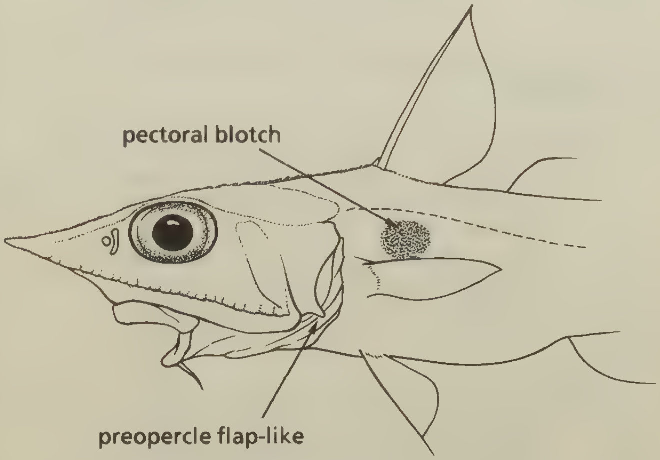
8a. Body markings prominent, consisting in adults of longitudinally aligned blotches, vermiculations, and rings that form roughly 3 irregular, broken stripes . ***C. multispinulosus*** (Fig. 335)

8b. Body markings faint or absent in adults, usually consisting of vertical or diagonal bars and longitudinal stripes

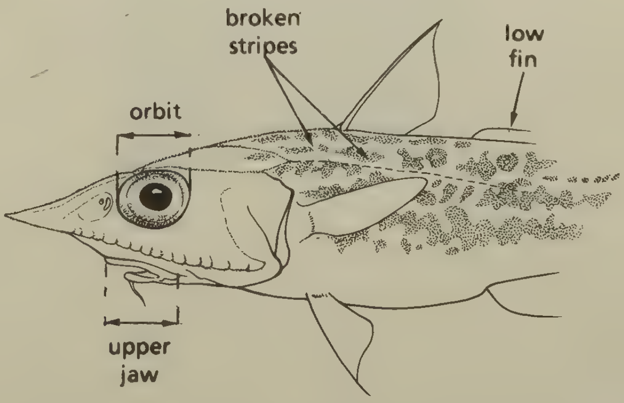
9a. Body markings in adults absent or faint at best; distance from isthmus to anal fin about 1.2 times in head length .. ***C. argentatus*** (Fig. 336)


snout very elongated
pectoral blotch
high fin
subopercle flap-like

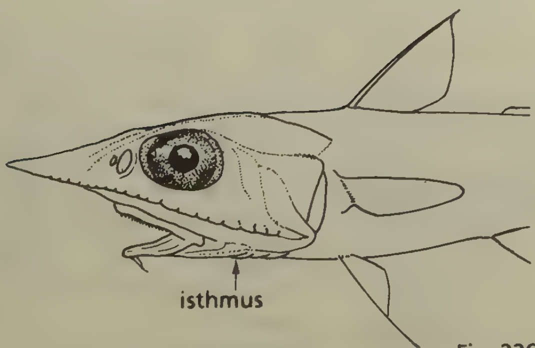
C. gladius Fig. 333


pectoral blotch
preopercle flap-like

C. matsubarai
(after Okamura, in Okamura et al., 1982) Fig. 334


broken stripes
low fin
orbit
upper jaw

C. multispinulosus
(after Okamura, 1970a) Fig. 335



C. argentatus Fig. 336

9b. Body markings usually present in adults; distance from isthmus to anal fin about 1.3 to 1.4 times in head length

10a. First dorsal fin with a blackish stripe just above base; pelvics with blackish bases and tips, the remainder pale; gillrakers on lower limb of first arch 6 to 8 .... ***C. denticulatus*** (Fig. 337)

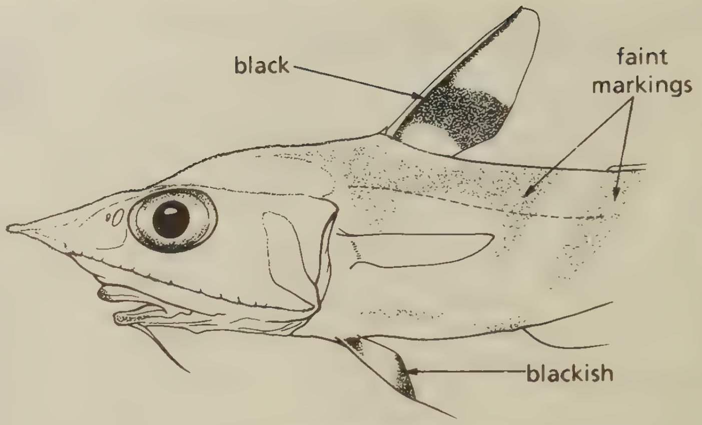
10b. First dorsal fin lacking a blackish stripe; pelvics uniformly blackish or punctate; gillrakers on lower limb of first arch 8 to 10 .... ***C. kamoharai*** (Fig. 338)

7b, Upper jaw about equal to or less than orbit diameter

11a. Upper jaw about equal to orbit diameter, 3.6 to 4.3 times in head length; height of anterior rays of second dorsal fin much less than opposites of anal fin; upper surface behind leading edge of snout naked .... ***C. longissimus*** (Fig. 339)

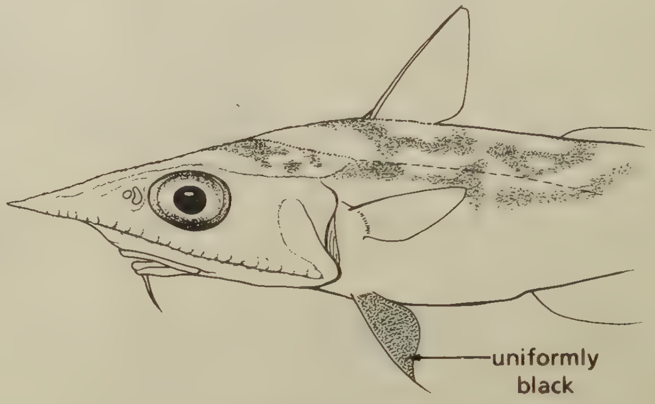
11b Upper jaw length less than orbit diameter, 3.7 to 5.2 times in head length; height of anterior rays of second dorsal fin about equal to opposites of anal fin; upper surface behind leading edge of snout scaled (Fig. 340)

12a. Prominent body markings consisting mostly of blotches and saddle marks; upper jaw about 5.2 times in head length; orbit about 4.5 times in head length; ventral end of sub-opercle developed into a short triangular flap .... ***C. cingulatus*** (Fig. 340)



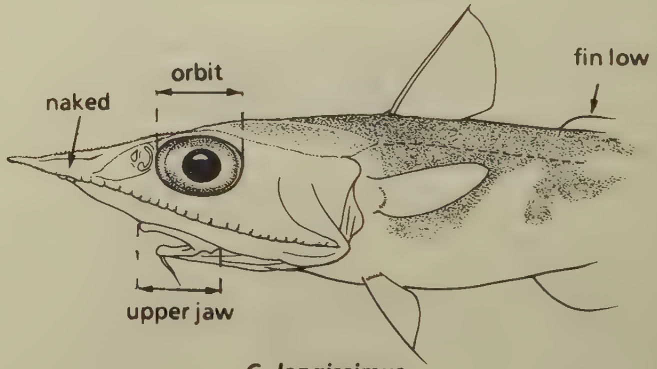
C. denticulatus
(after Iwamoto, in Smith & Heemstra, 1986)

Fig. 337



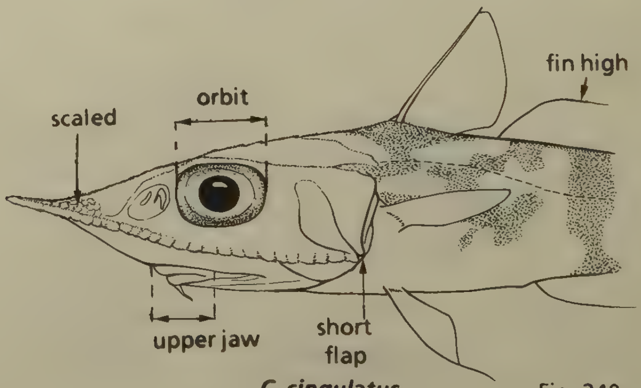
C. kamoharai
(after Matsubara, 1943)

Fig. 338



C. longissimus
(after Okamura, 1970a)

Fig. 339



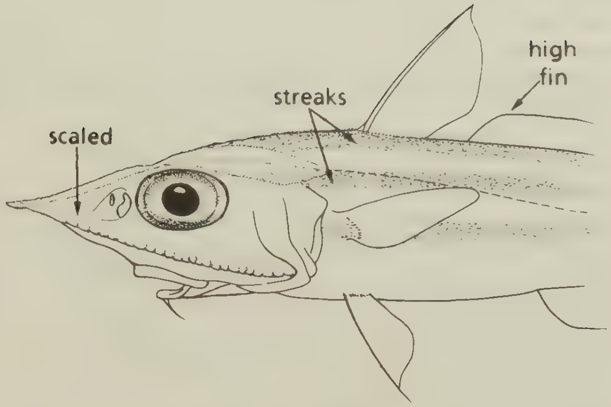
C. cingulatus
(after Gilbert & Hubbs, 1920)

Fig. 340

12b. Body markings absent or consisting primarily of longitudinal streaks; upper jaw about 3.7 to 4.6 times in head length; orbit about 3.1 to 3.7 times in head length; ventral end of subopercle not developed into a flap

13a. No body marks; upper jaw about 4.6 times in head length ... ***C. brevirostris***

13b. Three streaks on body; upper jaw about 3.7 to 4.5 times in head length .... ***C. hubbsi*** (Fig. 341)



C. hubbsi
(after Okamura, 1970a)

Fig. 341

List of Species :

Coelorinchus abditilux Merrett, 1980
Coelorinchus acanthiger Barnard, 1925
Coelorinchus acantholepis Gilbert & Hubbs, 1920
Coelorinchus aconcagua Iwamoto, 1978
Coelorinchus acutirostris Smith & Radcliffe, 1912
Coelorinchus anatirostris Jordan & Gilbert, 1904
Coelorinchus aratrum Gilbert, 1905
Coelorinchus argentatus Smith & Radcliffe, 1912
Coelorinchus argus Weber, 1913
Coelorinchus aspercephalus Waite, 1911
Coelorinchus asteroides Okamura, 1963
Coelorinchus australis (Richardson, 1839)
Coelorinchus biclinozonalis Arai & McMillan, 1982
Coelorinchus bollonsi McCann & McKnight, 1980
Coelorinchus braueri Barnard, 1925
Coelorinchus brevirostris Okamura, 1984
Coelorinchus canus (Garman, 1899)
Coelorinchus caribbaeus (Goode & Bean, 1885)
Coelorinchus carinifer Gilbert & Hubbs, 1920
Coelorinchus chilensis Gilbert & Thompson, 1916
Coelorinchus cingulatus Gilbert & Hubbs, 1920
Coelorinchus coelorhincus (Risso, 1810)
Coelorinchus commutabilis Smith & Radcliffe, 1912
Coelorinchus cookianus McCann & McKnight, 1980
Coelorinchus denticulatus Regan, 1921
Coelorinchus divergens Okamura & Yatou, 1984
Coelorinchus dorsalis Gilbert & Hubbs, 1920
Coelorinchus doryssus Gilbert, 1905

Coelorinchus ***fasciatus*** (Günther, 1878)
Coelorinchus ***flabellispinis*** (Alcock, 1894)
Coelorinchus ***formosanus*** Okamura, 1963
Coelorinchus ***gilberti*** Jordan & Hubbs, 1925
Coelorinchus ***gladius*** Gilbert & Cramer, 1897
Coelorinchus ***hexfasciatus*** Okamura, 1982
Coelorinchus ***hige*** Matsubara, 1943
Coelorinchus ***hubbsi*** Matsubara, 1936
Coelorinchus ***innotabilis*** McCulloch, 1907
Coelorinchus ***japonicus*** (Temminck & Schlegel, 1842)
Coelorinchus ***jordani*** Smith & Pope, 1906
Coelorinchus ***kaiyomaru*** Arai & Iwamoto, 1979
Coelorinchus ***kamoharai*** Matsubara, 1943
Coelorinchus ***karrerae*** Trunov, 1984
Coelorinchus ***kermadecus*** Jordan & Gilbert, 1904
Coelorinchus ***kishinouyei*** Jordan & Snyder, 1900
Coelorinchus ***labiatus*** (Koehler, 1896)
Coelorinchus ***longicephalus*** Okamura, 1982
Coelorinchus ***longissimus*** Matsubara, 1943
Coelorinchus ***macrochir*** (Günther, 1877)
Coelorinchus ***macrolepis*** Gilbert & Hubbs, 1920
Coelorinchus ***macrorhynchus*** Smith & Radcliffe, 1912
Coelorinchus ***maculatus*** Gilbert & Hubbs, 1920
Coelorinchus ***marinii*** Hubbs, 1934
Coelorinchus ***matamua*** (McCann & McKnight, 1980)
Coelorinchus ***matsubarai*** Okamura, 1982
Coelorinchus ***mirus*** McCulloch, 1926
Coelorinchus ***multispinulosus*** Katayama, 1942
Coelorinchus ***notatus*** Smith & Radcliffe, 1912
Coelorinchus ***occa*** (Goode & Bean, 1885)
Coelorinchus ***oliverianus*** Phillipps, 1927
Coelorinchus ***parallelus*** (Günther, 1877)
Coelorinchus ***platorhynchus*** Smith & Radcliffe, 1912
Coelorinchus ***productus*** Gilbert & Hubbs, 1916
Coelorinchus ***quadricristatus*** (Alcock, 1891)
Coelorinchus ***quincunciatus*** Gilbert & Hubbs, 1920
Coelorinchus ***radcliffei*** Gilbert & Hubbs, 1920
Coelorinchus ***scaphopsis*** (Gilbert, 1890)
Coelorinchus ***sexradiatus*** Gilbert & Hubbs, 1920
Coelorinchus ***smithi*** Gilbert & Hubbs, 1920
Coelorinchus ***sparsilepis*** Okamura & Yatou, 1984
Coelorinchus ***spinifer*** Gilbert & Hubbs, 1920
Coelorinchus ***thompsoni*** Gilbert & Hubbs, 1920
Coelorinchus ***tokiensis*** (Steindachner & Döderlein, 1887)
Coelorinchus ***triocellatus*** Gilbert & Hubbs, 1920
Coelorinchus ***velifer*** Gilbert & Hubbs, 1920
Coelorinchus ***ventrilux*** Marshall & Iwamoto, 1973
Coelorinchus ***weberi*** Gilbert & Hubbs, 1920

Coelorinchus acanthiger Barnard, 1925

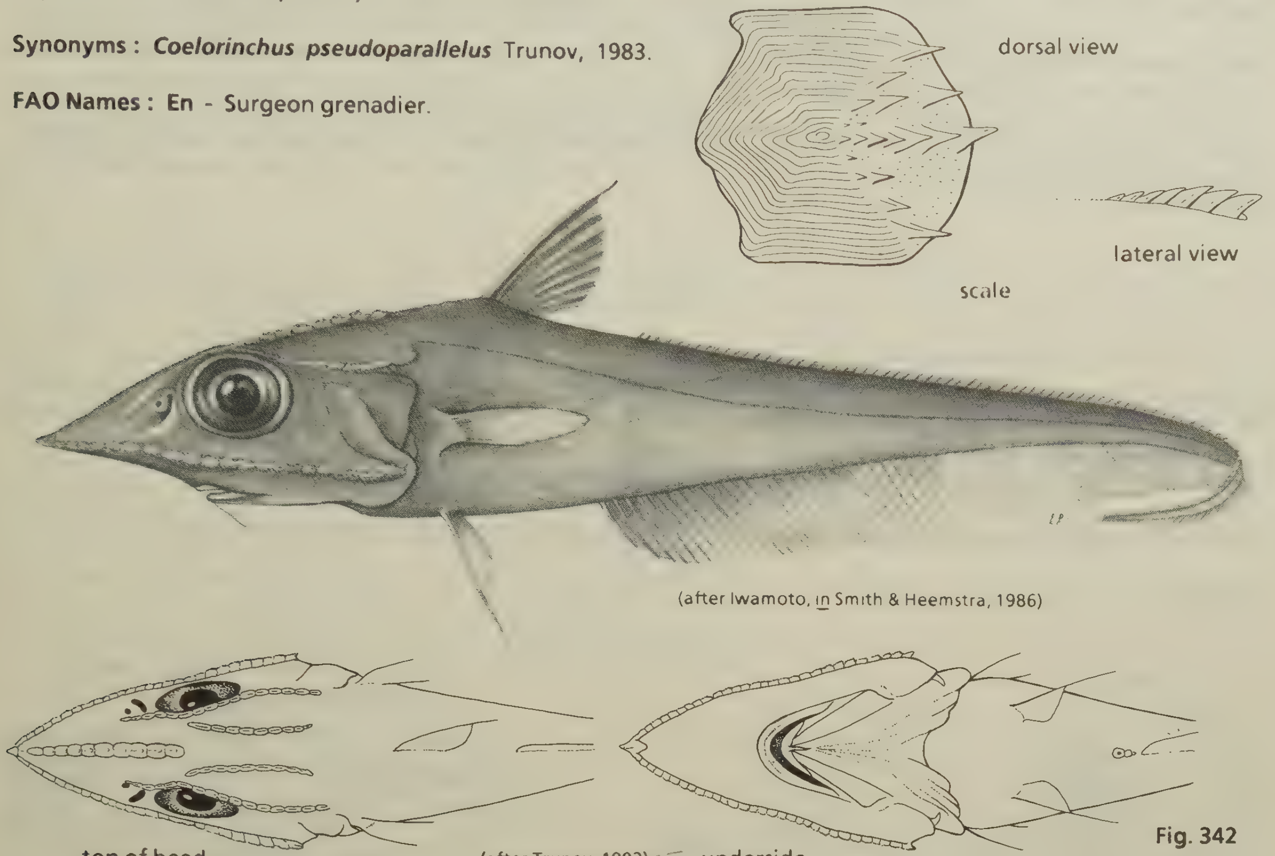
Fig. 342

MACROUR Coel 4

Scientific Name with Reference : ***Coelorinchus acanthiger*** Barnard, 1925, Ann.Mag.Nat.Hist. ser. 9, 15(87):502 (off Cape Point, South Africa, 841 m).

Synonyms : ***Coelorinchus pseudoparallelus*** Trunov, 1983.

FAO Names : En - Surgeon grenadier.



(after Iwamoto, in Smith & Heemstra, 1986)

(after Trunov, 1983)

Fig. 342

Diagnostic Features : Snout long, pointed, its length much more than orbit diameter, its anterolateral margins incompletely supported by bone; upper jaw extending to below posterior 1/4 of orbits; barbel short; underside of head scaled; subopercle posteroventrally forms a narrow flap; teeth in bands in both jaws, premaxillary band shorter than mandibular band; inner gill rakers on first arch 2 upper and 6 or 7 lower (8 or 9 total); snout 43 to 46% of head length; orbit 25 to 30%; interorbital space 21 to 25%; upper jaw 22 to 26% barbel; 7 to 9% of head length. First dorsal fin 2 spines, 7 to 9 rays; pectoral fins 20 or 21 rays (including 1 rudimentary ray). Light organ small, its length about equal to anterior nostril. Body scales coarse, with 1 to 3 sharp, ridgelike rows of close, essentially overlapping, recurved, bladelike spinules, rows parallel to slightly divergent. Scale rows below midbase of first dorsal fin 5.5 to 7. Swimbladder weakly bilobed anteriorly; 4 retia mirabilia. Pyloric caeca 10 to 12. **Colour:** brownish overall, darker over gill covers, gill membranes and fins; mouth and gill cavities darker.

Geographical Distribution : Southeastern Atlantic on Walvis Ridge, Discovery Seamount, off Namibia and South Africa; Mozambique Plateau and Mascarene Ridge in the Indian Ocean; possibly off West Australia and New Zealand (Fig. 343).

Habitat and Biology : A benthopelagic slope species of the temperate southeastern Atlantic and tropical Indian Ocean, in depths from 800 to 1 270 m.

Size : To 50 cm total length.

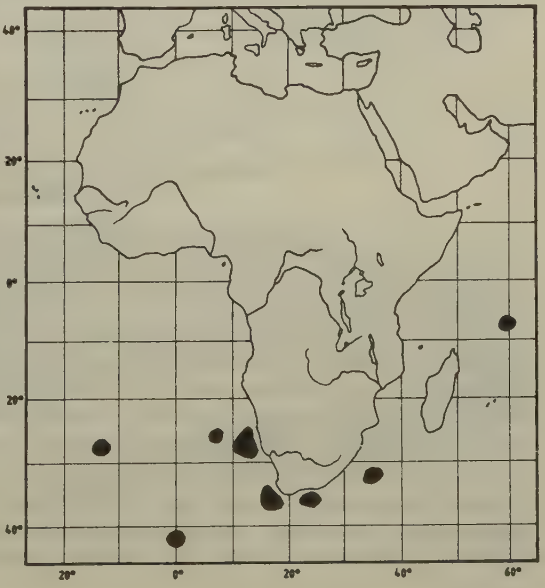


Fig. 343

Interest to Fisheries : A rather common species in slope waters of southern Africa, but not now of commercial interest.

Literature : Barnard (1925a, b); Trunov (1983).

Remarks : ***Coelorinchus acanthiger*** is apparently closest to ***C. parallelus*** (Günther, 1877) from the area off Japan and the East China Sea but differs in having more scale rows below mid-dorsal fin (5.5 to 7 compared with 4 to 4.5); fewer spinules rows on trunk scales (3 to 5 compared with 7 to 9); and interspace between dorsals more than first dorsal fin base (about equal to in ***C. parallelus***). Among South African species, it is most similar to ***C. braueri*** but can be distinguished from that species in its somewhat broader snout, its fewer rows of spinules on trunk scales (1 to 5 compared with 5 to 8), the individual bladelike spinules being more dilated at the base than in ***C. braueri***; its more numerous scales below mid-base of first dorsal fin (5.5 to 7 compared with 4 to 4.5); and some differences in pigmentation.

Coelorinchus aconcagua Iwamoto, 1978

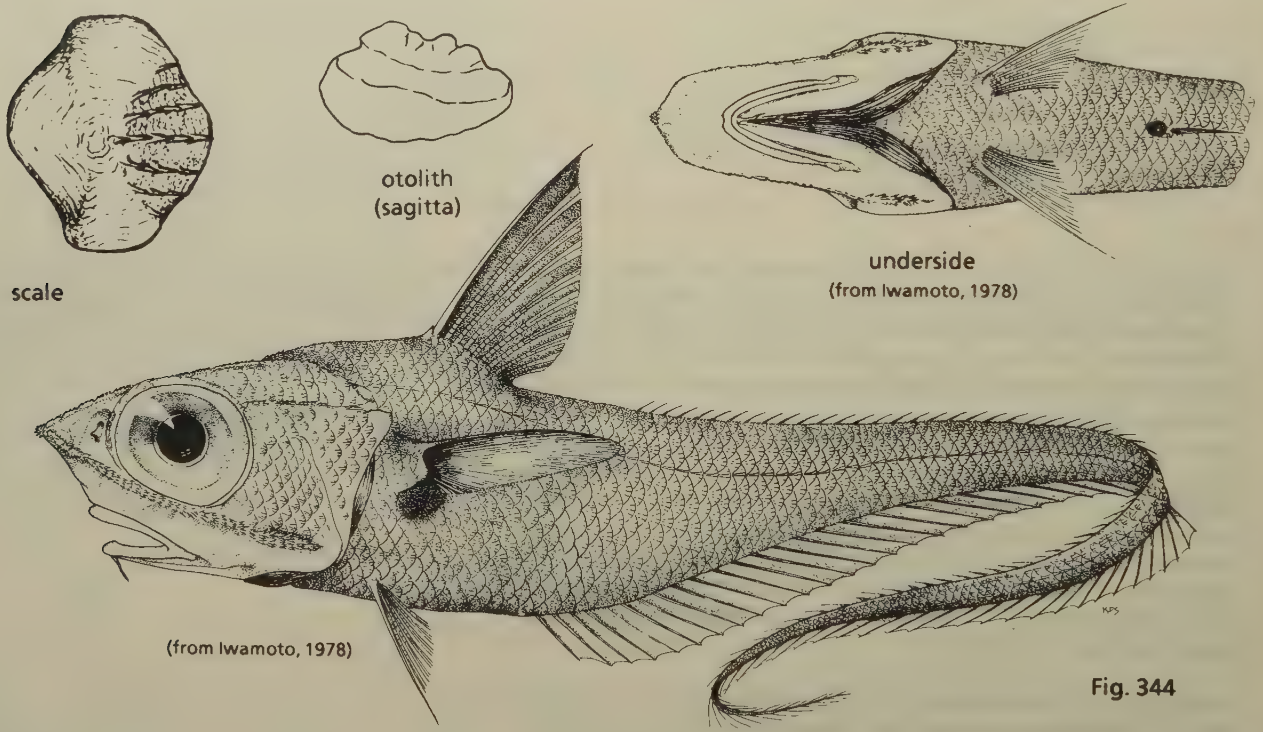
Fig. 344

MACROUR Coel 5

Scientific Name with Reference : ***Coelorinchus aconcagua*** Iwamoto, 1978, Proc.Calif.Acad.Sci., ser. 4, 41(12):319, figs 3D, 7E, 8, 10 (Chile; 33°22'S, 71°53'W; 240 to 260 m).

Synonyms : ***Coelorhynchus patagoniae*** (non ***C. patagoniae*** Gilbert & Thompson, 1916) - Pequeño, 1971.

FAO Names : **En** - Aconcagua grenadier.



scale

otolith (sagitta)

underside (from Iwamoto, 1978)

(from Iwamoto, 1978)

Fig. 344

Diagnostic Features : Snout short (24 to 30% of head length), bluntly pointed, its anterolateral margin incompletely supported by bone; orbits large, 37 to 44% of head length; upper jaw moderately large, 29 to 36% of head length; head ridges rather low and narrow; underside of head and broad areas around nostrils and dorsal snout surfaces naked; teeth small, fine, in moderately wide bands that extend to posterior angles of mouth (rictus not restricted); inner gill rakers of first arch 2 or 3 + 9 to 12. First dorsal fin with 2 spines and 9 or 10 rays, its height usually less than the postrostral length of head; pectoral fin rays i16 to i20. Light organ rather short, extending in front of anus within body wall as a flattened, elongate diverticulum falling well short of pelvic fin bases, its length about 2/3 of pupil diameter, externally visible only as a blackish area before anus; fossa absent. Scales rather deciduous, large; those on body with 7 to 12 subparallel rows of short spinules, none markedly enlarged, most body scales with broad spinuleless margins; scale rows below midbase of first dorsal fin 3.5 to 4.5. Swimbladder large, oval with 4 short, broad retia mirabilia. Pyloric caeca 16 to 20, their length about equal to pupil diameter. **Colour**: brownish to swarthy; trunk bluish to violet; fins dusky to blackish; a prominent blackish area behind pectoral fin bases; mouth and gill cavities pale, except blackish distally in the latter.

Geographical Distribution : Chile between 30°S and 41°S; Argentine Patagonia (Fig. 345).

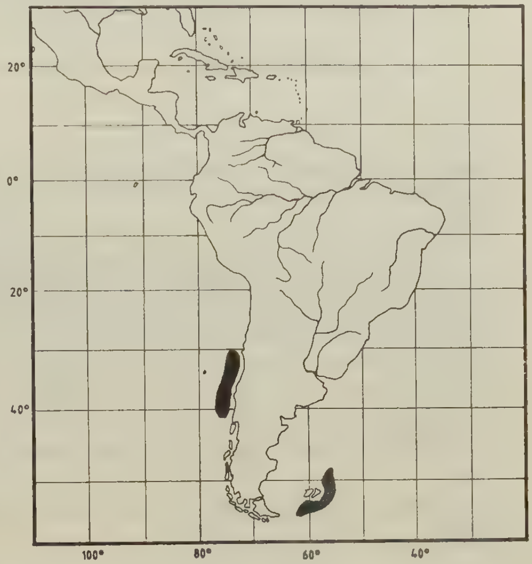


Fig. 345

Habitat and Biology : Benthopelagic in 119 to 450 m depth. Feeds on copepods, pagurid and brachyurid crabs, and shrimplike crustaceans.

Size : To 39 cm.

Interest to Fisheries : Apparently encountered in moderate numbers as bycatch of trawlers off southern Chile, but no separate statistics are maintained.

Literature : Pequeño (1971) (as *C. patagoniae*); Iwamoto (1978); Nakamura (1986) (as ***Coryphaenoides whitsoni***).

Remarks : Pequeño (1971) understandably thought that his specimens of this species were representatives of ***C. patagoniae***, the only other nominal species of the genus then known from Pacific waters off southern Chile. The holotype of ***C. patagoniae*** is, however, a small specimen of ***C. fasciatus*** (Günther, 1878), a species that superficially resembles ***C. aconcagua***. The 10 specimens from the Patagonian slopes of Argentina reported by Nakamura (1986) (as ***Coryphaenoides whitsoni***) are the first records of the species from the Atlantic.

Coelorinchus anatirostris Jordan & Gilbert, 1904

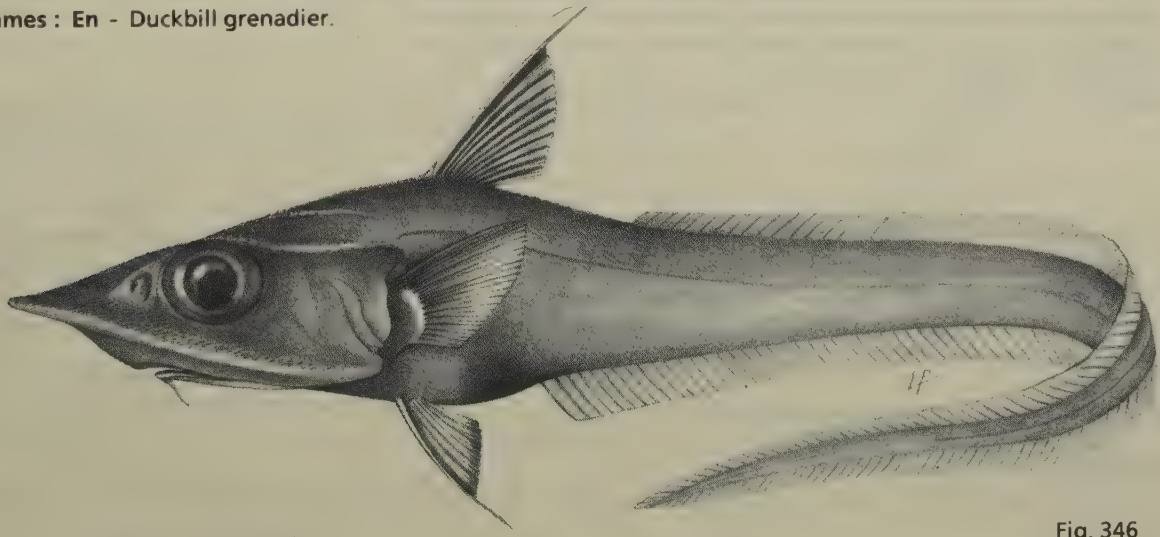
Fig. 346

MACROUR Coel 6

Scientific Name with Reference : ***Coelorhynchus anatirostris*** Jordan & Gilbert, 1904, Bull.U.S.Fish. Comm., 1902:619, fig. (Misaki, Japan).

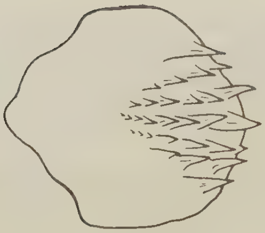
Synonyms : ***Coelorhynchus anatirostris*** - Franz, 1910; ***Coelorhynchus anagirostris*** - Jordan & Thompson, 1914.

FAO Names : **En** - Duckbill grenadier.

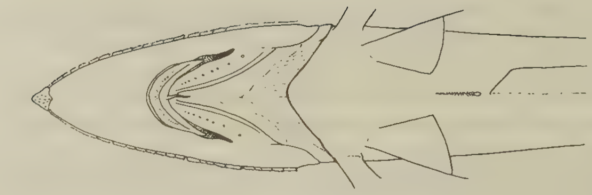


(after Okamura, 1970a)

Fig. 346



scale
(after Okamura, 1970a)



underside
(after Okamura, 1970a)

Diagnostic Features : Snout moderately long, pointed, 1.3 to 1.6 times the orbit diameter, 40 to 44% of head length, sides of snout convex in dorsal view, its antero-laterai margin completely supported by bone; orbit 28 to 30% of head length; upper jaw 25 to 27% of head length; head ridges very strong, supraoccipital scute developed, several dorsomedian scutes follow on nape; underside of head naked except for 2 small patches (one below orbit, the other below preopercle angle in largest specimens). First dorsal fin with 2 spines and 8 to 10 rays, its height about equal to or less than the postrostral length of head; pectoral fin rays i16 to i18; inner gill rakers of first arch 0 to 2 + 5 to 7. Light organ small, its length 2.1 to 3.5 times into orbit; fossa narrow, extending forward immediately before anus, its anterior end falling well short of level of pelvic fin insertions. Body scales covered with narrowly lanceolate to triangular spinules in 4 to 10 slightly divergent, ridgelike rows, the median row strongest; scale rows below midbase of first dorsal fin 3.5 to 4.5. Pyloric caeca 21 to 30. **Colour:** overall greyish, fins dusky to black; no distinctive body or fin markings; mouth cavity greyish, gill cavity blackish.

Geographical Distribution : Southern Japan to East China Sea (Fig. 347).

Habitat and Biology : Benthopelagic in 300 to 550 m, in waters of 7 to 12°C temperature.

Size : To at least 43 cm.

Interest to Fisheries : Used for fish sausages or reduction to fish meal. No separate catch statistics are recorded.

Local Names : JAPAN: Nezumia-hige.

Literature : Jordan & Gilbert (1904); Okamura (1970a); Okamura et al. (1982); Yatou in Okamura & Kitajima (1984).

Remarks : Okamura (1970a) synonymized *C.* ***productus*** with this species, attributing supposed differences to individual or ontogenetic variation. Yatou (in Okamura & Kitajima, 1984), however, subsequently recognized its distinctness based on its longer snout (43.5 to 45.5% of head length compared with 40 to 43.5% of head length in *C.* ***anatirostris***), shorter upper jaw (21.7 to 23.3% of head length compared with 25 to 27%), narrower head width (43.5 to 45.5% of head length compared with 45.5 to 52.7%), and shorter barbel (25 to 33.3% of orbit diameter compared with 33 to 43%).

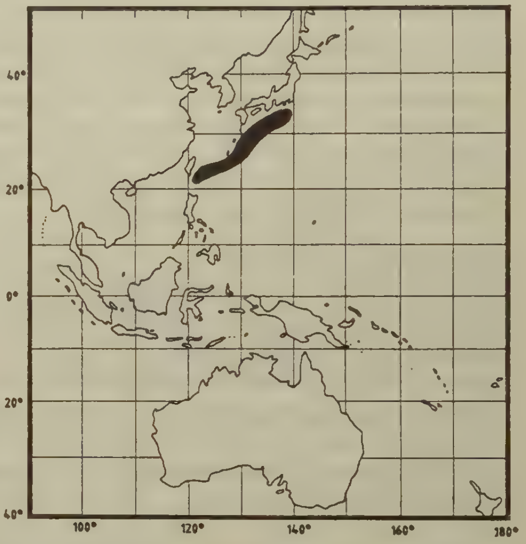


Fig. 347

Coelorinchus argentatus Smith & Radcliffe, 1912

Fig. 348

MACROUR Coel 7

Scientific Name with Reference : ***Coelorhynchus argentatus*** Smith & Radcliffe, in Radcliffe, 1912, Proc.U.S.Natl.Mus., 43:137, pl. 31, fig. 1.

Synonyms : ***Coelorhynchus acus*** Weber, 1913.

FAO Names : En - Silver whiptail.

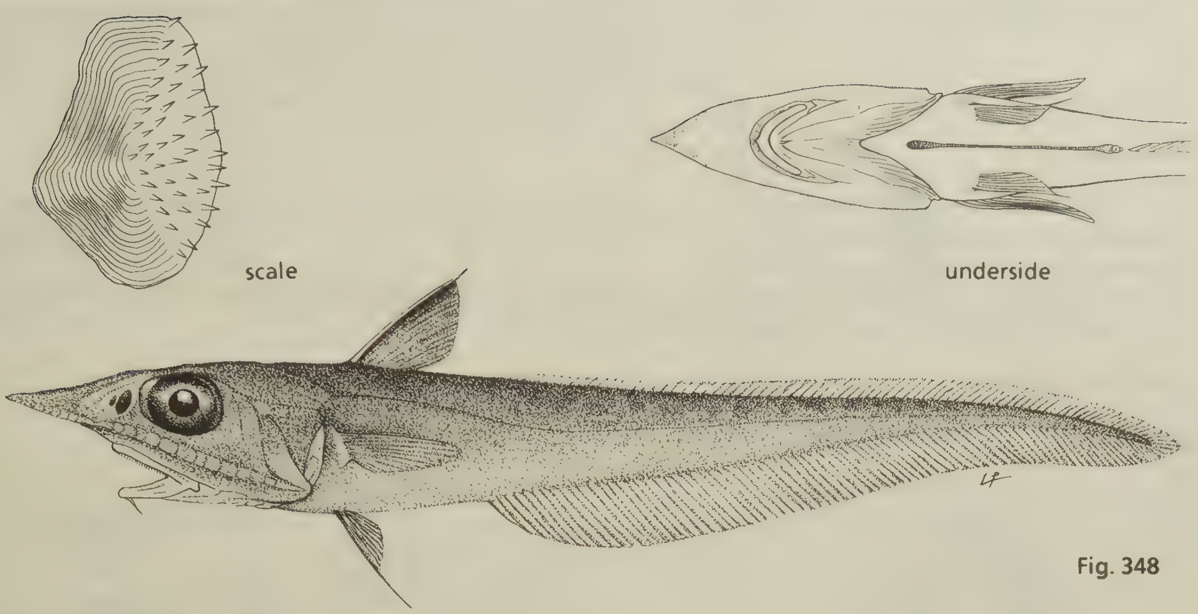


Fig. 348

Diagnostic Features : Snout long (40 to 42% of head length), sharply pointed, much longer than orbit diameter (24 to 26% of head length), anterolateral margin incompletely supported by bone; upper jaw rather long (31 to 34% of head length), slightly longer than orbit but shorter than snout, extends to below posterior 1/4 of orbit; mouth scarcely restricted by lip folds, rictus extends to below midorbit; barbel small (8 to 11% of head length), less than length of posterior nostril; subopercle lacking prolonged tip; preopercular margin acute at posteroventral corner; head ridges well developed but rather finely spinulated; underside of head completely naked except for characteristic scales along anteroventral edge of snout; entire nasal region, large crescent-shaped area anterolaterally on either side of dorsal snout surface, and area below posteroventral corner of orbit, naked; teeth in upper jaw in a long, moderately tapered band about 5 teeth wide, outer series slightly enlarged, the band extending to the end of rictus; lower jaw teeth 2 or 3 irregular series wide, the teeth developed to end of rictus; inner gill rakers of first arch 2 + 6 or 7 (8 or 9 total). First dorsal fin with 2 spines and 8 to 10 rays, its height less than postrostral length of head; pectoral fin rays i15 to i18. Anus immediately before anal fin; a long black streak of light organ extending from before anus to close behind isthmus, dilated at each end and forming shallow fossae. Scales covered with fine spinulation, the spinules short, conical, slightly recurved, in quincunx order; scale rows below midbase of first dorsal fin 4. Swimbladder oval, the anterior end forming blunt lobes. Pyloric caeca about 9. **Colour:** pale brown dorsally, silvery ventrally; faint blotches dorsally below dorsal fins, more prominent in young; perimeter of first dorsal fin base, second dorsal spine and median process of nasal bone all blackish; head covering translucent to transparent; mouth lining whitish, branchial cavity whitish along hyoid arch, dark elsewhere.

Geographical Distribution : The Philippines, Indonesia, and northwestern Australia (Fig. 349); questionably from South Africa.

Habitat and Biology : Benthopelagic in 85 to 582 m. Feeds on shrimplike crustaceans, among other items.

Size : To about 37 cm.

Interest to Fisheries : A common species in relatively shallow waters where it is occasionally taken by trawlers.

Literature : Smith & Radcliffe (1912); Gilbert & Hubbs (1920).

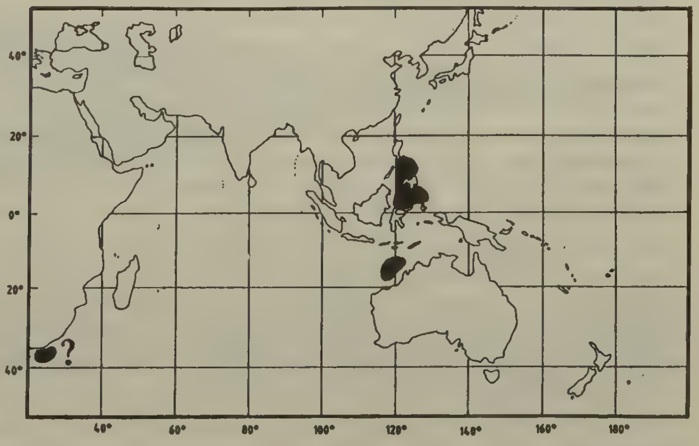


Fig. 349

Remarks : Barnard's (1925b) reference of a 10 cm specimen from east of Algoa Bay, South Africa, must be considered questionable in view of the shorter maxilla and longer barbel of that individual, compared with Philippine specimens.

Coelorinchus argus Weber, 1913

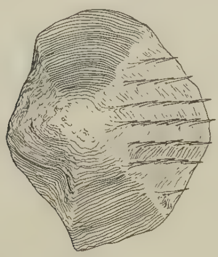
Fig. 350

MACROUR Coel 8

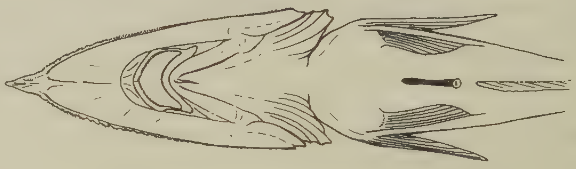
Scientific Name with Reference : ***Coelorhynchus argus*** Weber, 1913, Fische SIBOGA Exped., 57:161, pl. 4, fig. 4, 4a (Flores Sea, Makassar Strait, Molucca Passage, Bali, 397 to 538 m).

Synonyms : None.

FAO Names : En - Eyespot grenadier.



scale



underside

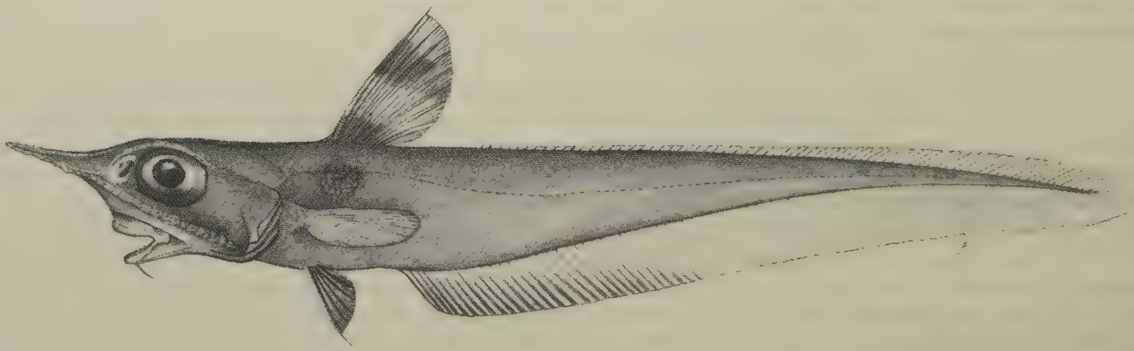


Fig. 350

Diagnostic Features : Snout moderately long, about 1.5 times the orbit diameter, 42 to 45% of head length, slender, acutely pointed, tipped with a sharp, finely spinulated scute, its anterolateral margin completely supported by bone; orbit less than snout length, 27 to 29% of head length; upper jaw 21 to 26% of head length; maxillary extends to below middle of orbit; barbel short, about 1/2 of pupil diameter, much less than diameter of posterior nostril; subopercle produced into a small, narrow tab at ventral end; suborbital ridge strong and sharp, but rather finely spinulated; other head ridges stout and similarly spinulated; underside of head completely naked; small areas above snout, around nostrils, and below anteroventral rim of orbit also naked; teeth all small, in a broad short band on premaxillae, the band extending slightly more than 1/2 of length of rictus; mandibular teeth in narrow band extending to end of rictus; inner gill rakers on first arch 2 + 5. First dorsal fin with 2 spines and 8 or 9 rays, its height about equal to postrostral length of head; pectoral fin rays i13 to i16. Scales with 6 to 10 parallel to slightly divergent rows of small, close-set spinules; scale rows below midbase of first dorsal fin 4 to 4.5. Swimbladder truncated or slightly bilobed anteriorly; 4 retia mirabilia. Light organ extends as a narrow black strip forward of anus to about level of pelvic fin insertions; anus separated by about 3 scale rows from anal fin origin. **Colour:** overall coloration grey-brown; a large black blotch 7 scale rows wide by 5 deep above and behind pectoral fin bases; first dorsal fin and pelvic fins blackish; pectoral fins dusky; mouth and gill cavities dusky, lip and jaw surfaces otherwise pale; operculum and trunk ventrally blackish.

Geographical Distribution : The Philippines and Indonesia (Fig. 351).

Habitat and Biology : Benthopelagic in 124 to 424 m. Small fish (including juveniles of ***Bregmaceros***), copepods, polychaetes, and other bottom invertebrates have been found in the stomachs.

Size : To about 20 cm total length.

Interest to Fisheries : A common but small species in about 100 to 400 m depth.

Literature : Weber (1913); Weber & de Beaufort (1929); Gilbert & Hubbs (1920).

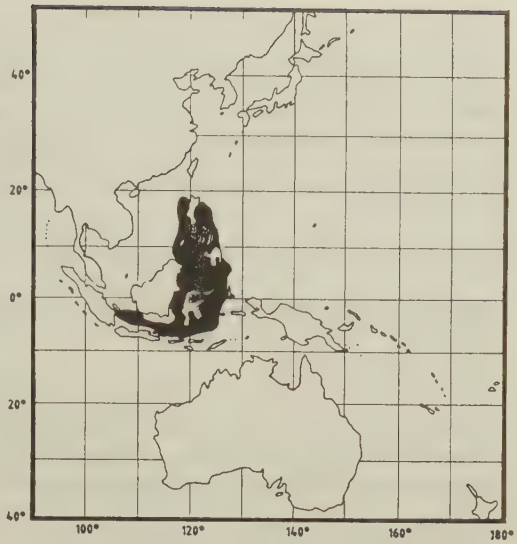


Fig. 351

Coelorinchus aspercephalus Waite, 1911

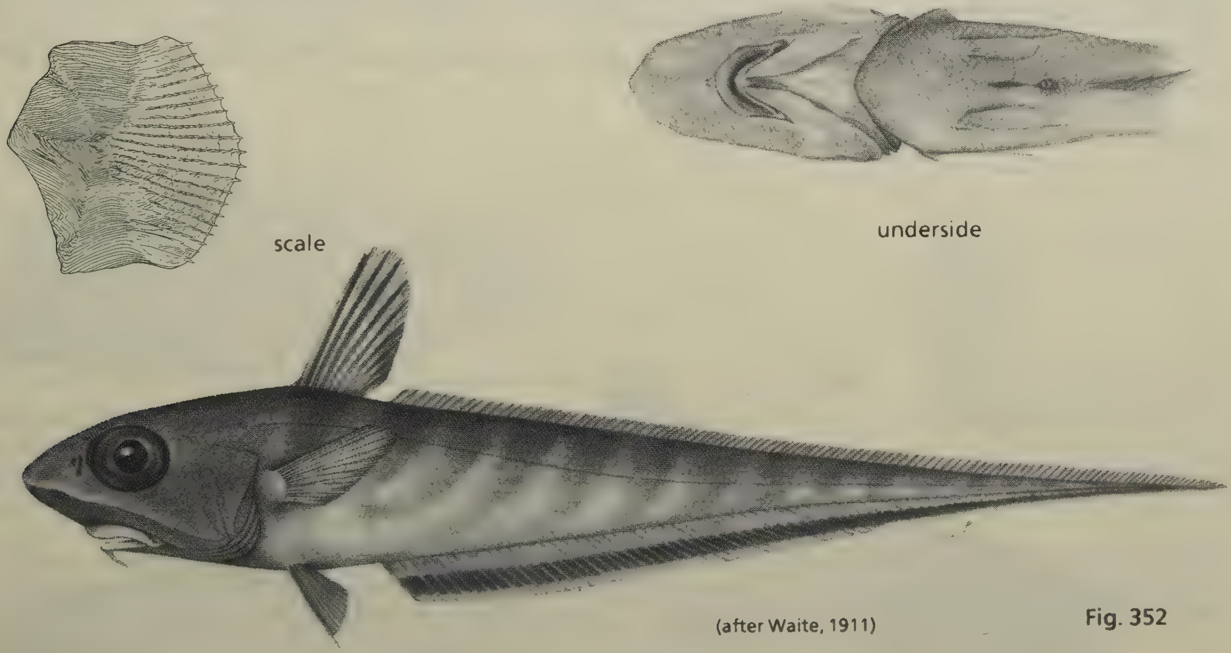
Fig. 352

MACROUR Coel 9

Scientific Name with Reference : ***Coelorhynchus aspercephalus*** Waite, 1911, Rec.Canterbury Mus., 1(3):178, pl. 29, text-fig. 2 (off New Zealand).

Synonyms : None

FAO Names : En - Rough-head whiptail.



(after Waite, 1911)

Fig. 352

Diagnostic Features : Snout rounded, without sharp points, its anterolateral margin incompletely supported by bone; orbit about 35 to 40% of head length, longer than snout, about equal to postorbital length of head; upper jaw 33 to 34% of head length; head gently rounded, completely scaled, without strong scutelike ridges and no broad naked areas; teeth small, in a broad band on premaxillary, extending about half the length of rictus; in a broad, tapered band on mandible extending to the posterior end of rictus; inner gill rakers on first arch 1 or 2 + 7 or 8. First dorsal fin with 2 spines and 9 or 10 rays, its greatest height about equal to postrostral length of head; pectoral fin rays i14 to i17. Light organ lanceolate to narrowly oval, extending forward to midway between anus and pelvic fin insertions. Scales adherent, finely spinulated, the tiny imbricate keel-like spinules arranged in up to 22 subparallel rows, none enlarged; scale rows below midbase of first dorsal fin 4.5 to 5.5. Swimbladder rather deeply bilobed anteriorly. Pyloric caeca about 32. **Colour:** overall greyish to light brown; 10 or more narrow, oblique pale bars extend down and forward over head and body, faint in some individuals. A prominent lateral stripe on anal fin, darker posteriorly; first dorsal fin pale at base but mostly blackish overall; other fins dusky to blackish; mouth and gill cavities dark.

Geographical Distribution : New Zealand (Fig. 353).

Habitat and Biology : Benthopelagic in 33 to 335 m.

Size : To at least 34 cm.

Interest to Fisheries : Common in upper slope waters off New Zealand where they are frequently caught by commercial and research vessels (McMillan in litt.).

Literature : Waite (1911); McCann & McKnight (1980).

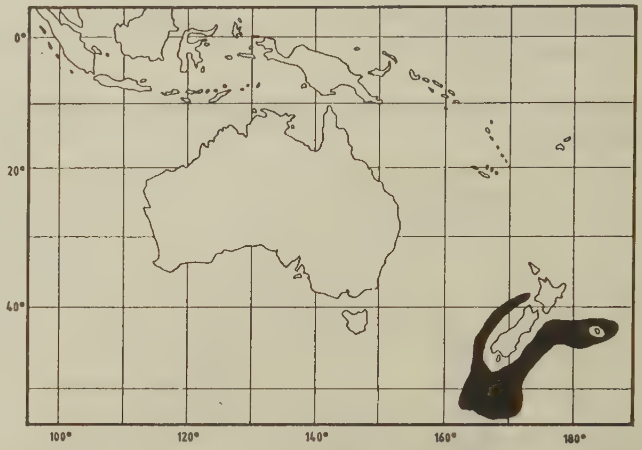


Fig. 353

Coelorinchus australis (Richardson, 1839)

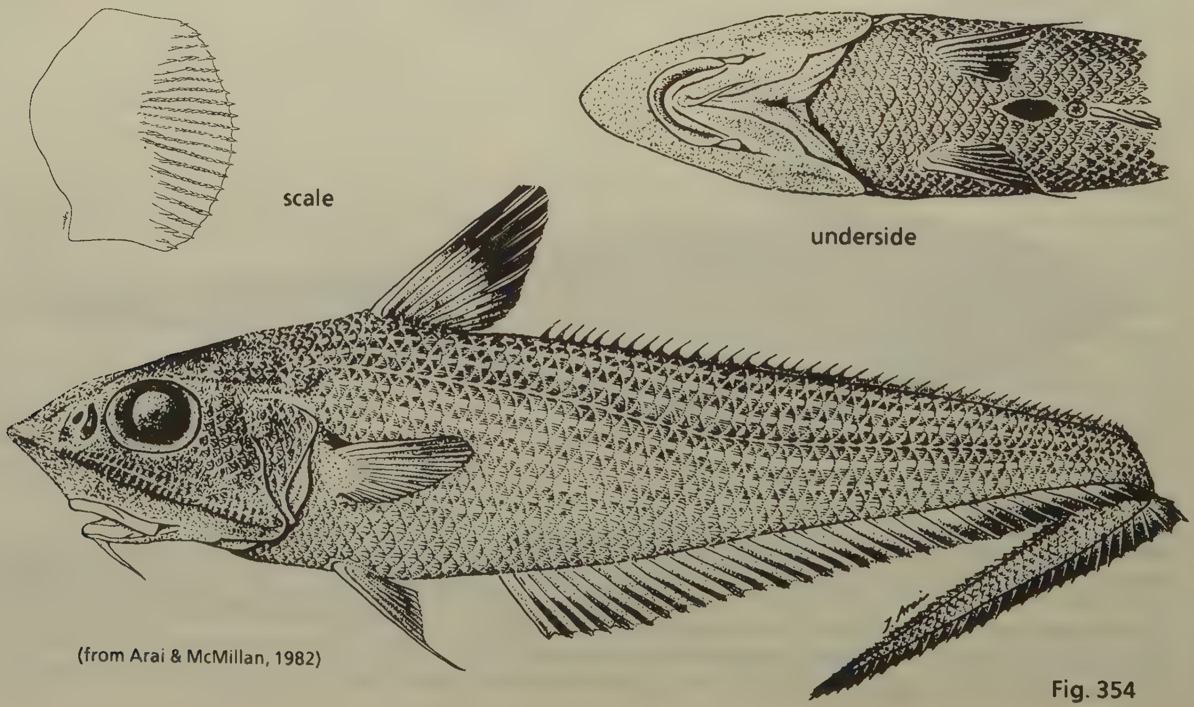
Fig. 354

MACROUR Coel 10

Scientific Name with Reference : ***Lepidoleprus australis*** Richardson, 1839, Rec.Zool.Soc.Lond., 3:100 (Port Arthur, Tasmania).

Synonyms : ***Macrurus australis*** - Günther, 1862; ***Coelorhynchus mortoni*** Ogilby, 1897; ***Coelorhynchus australis*** - McCulloch, 1911.

FAO Names : En - Javelin.



(from Arai & McMillan, 1982)

Fig. 354

Diagnostic Features : Snout rather blunt, without a sharp rostral spine, its anterolateral margin incompletely supported by bone; orbit diameter 30 to 37% of head length, about 0.9 to 1.1 times into snout length; upper jaw 29 to 34% of head length; head ridges strong, but not conspicuously modified; underside of head completely scaled (except along mandibular margins and gill membranes); teeth small, in a broad, short band on premaxillae, extending short of 1/2 the rictus length; in a broad tapered band on mandible, extending to the end of rictus; inner gill rakers of first arch 1 or 2 + 6 or 7. First dorsal fin with 2 spines and 9 to 11 rays, its height about equal to postrostral length of head; pectoral fin rays i13 to i18. Light organ elongate to ovoid, extending forward to midway between anus and pelvic fin insertions. Scales relatively adherent, those on body with as few as 5 or 6 parallel rows of small, reclined spinules in individuals measuring from 30 to 45 mm head length, to as many as 23 or 24 rows in 13.5 cm head length specimens; scale rows below midbase of first dorsal fin 3.5 to 4.5. Swimbladder deeply bilobed anteriorly. Pyloric caeca 31 to 34. **Colour:** head dark brown dorsally, with small pale spots; body dark brownish lined with 8 or 9 narrow, pale longitudinal stripes; first dorsal fin black-tipped, other fins dusky to blackish, anal fin with a blackish stripe posteriorly; mouth and gill cavities blackish.

Geographical Distribution : Southeastern Australia (Fig. 355).

Habitat and Biology : Benthopelagic in 80 to 300 m. Feeds on octopods, fish, and decapod crustaceans.

Size : To at least 55 cm total length.

Interest to Fisheries : Commonly trawled on the continental shelf and slope down to 300 m around Tasmania.

Literature : Richardson (1841); Arai & McMillan (1982); Last et al. (1983) (illustration of *C. biclinozonalis* from Waite, 1911).

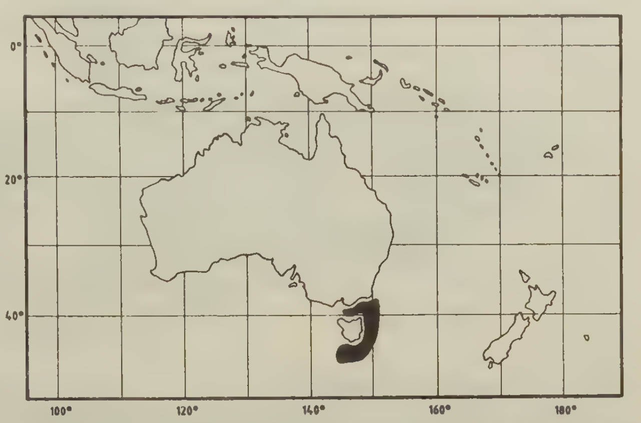


Fig. 355

Remarks : This species has been confused with *C. biclinozonalis* from New Zealand, but Arai & McMillan (1982) distinguished their new species from *C. australis* and showed that the two are geographically separated. Waite's (1911) frequently used illustration represents a New Zealand specimen of *C. biclinozonalis*, not *C. australis*, which lacks the prominent saddle marks of the former, lacks a spinous terminal snout scute and has a distally black first dorsal fin (dusky in *C. biclinozonalis*).

Coelorinchus biclinozonalis Arai & McMillan, 1982

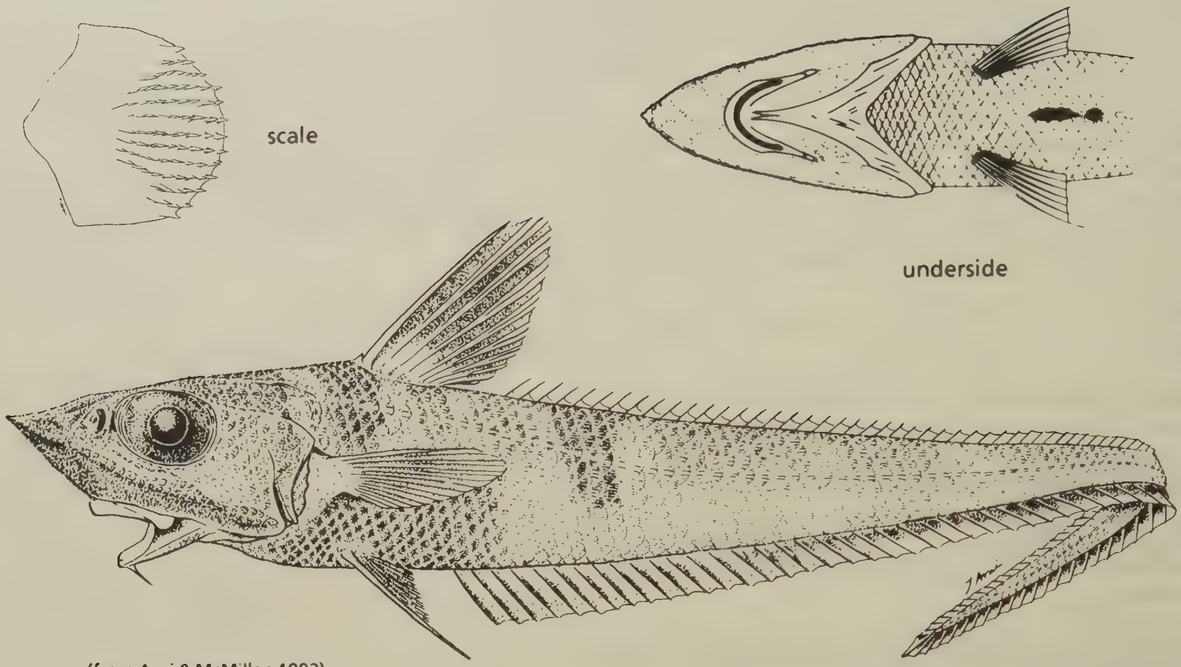
Fig. 356

MACROUR Coel 11

Scientific Name with Reference : ***Coelorinchus biclinozonalis*** Arai & McMillan, 1982, Japan.J.Ichthyol., 29(2):115 (Cloudy Bay, New Zealand, 55 to 60 m).

Synonyms : ***Macrurus australis*** (non Richardson, 1839)-Hutton & Hector, 1872; ***Macrurus (Coelorhynchus) australis*** (partim; non Richardson, 1839) - Günther, 1887; ***Coelorhynchus australis*** (non Richardson, 1839) - Waite, 1911; ***Coelorinchus australis*** (non Richardson, 1839) - Scott, 1953; ***Coelorinchus oliverianus*** (non Phillipps, 1927) - Graham, 1956; ***Coelorinchus*** sp. B - Suisancho, 1978.

FAO Names : **En** - Two-barred whiptail.



(from Arai & McMillan 1982)

Fig. 356

Diagnostic Features : Snout pointed, its anterolateral margin incompletely supported by bone; orbit 27 to 39% of head length, 0.9 to 1.4 times into snout; upper jaw 24 to 32% of head length; teeth small, in moderately broad bands in both jaws; premaxillary band short, extending to about midpoint of rictus; mandibular band narrower and longer, extending to end of rictus; inner gill rakers on first arch 1 or 2 + 6 to 8; head ridges low, weak; underside of head mostly scaled. First dorsal fin with 2 spines and 9 to 11 rays, its height about equal to or slightly greater than postrostral length of head; pectoral fin rays i14 to i18. Light organ large, a lens-shaped fossa on abdomen extends forward to midway between anus and pelvic fin insertions. Scales large, those on body with small imbricate spinules arranged in as many as 24 subparallel rows in the largest individuals, none enlarged; scale rows below midbase of first dorsal fin 3.5 to 4.5. Swimbladder deeply bilobed anteriorly, its posterior end pointed. Pyloric caeca 35 to 49. **Colour:** brownish overall; two dark saddle marks, one below nape, the other below anterior end of second dorsal fin; a lateral stripe along length of anal fin, darker posteriorly. First dorsal fin dusky, pale along base; mouth and gill cavities dark.

Geographical Distribution : New Zealand (Fig. 357).

Habitat and Biology : Benthopelagic in 4 to 549 m.

Size : To more than 60 cm total length.

Interest to Fisheries : Commonly taken by trawls on the upper continental slope and shelf.

Literature : Waite (1911) (as *C. australis*); McCann & McKnight (1980) (as *C. australis*); Arai & McMillan (1982).

Remarks : This species was long confused with ***C. australis*** Richardson (1839), until Arai & McMillan (1982) recognized its distinctness. All previous records of ***C. australis*** from New Zealand waters are probably referable to ***C. biclinozonalis***.

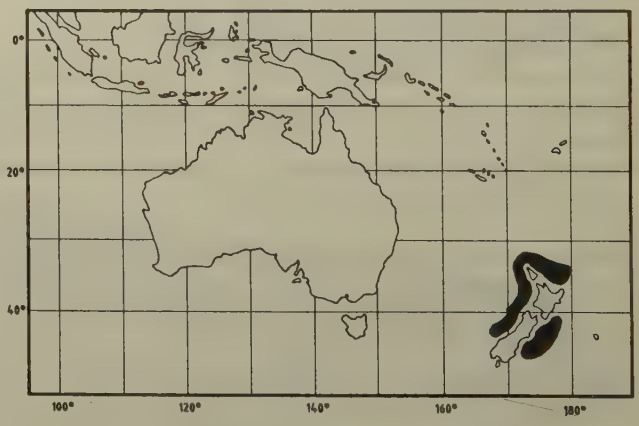


Fig. 357

Coelorinchus braueri Barnard, 1925

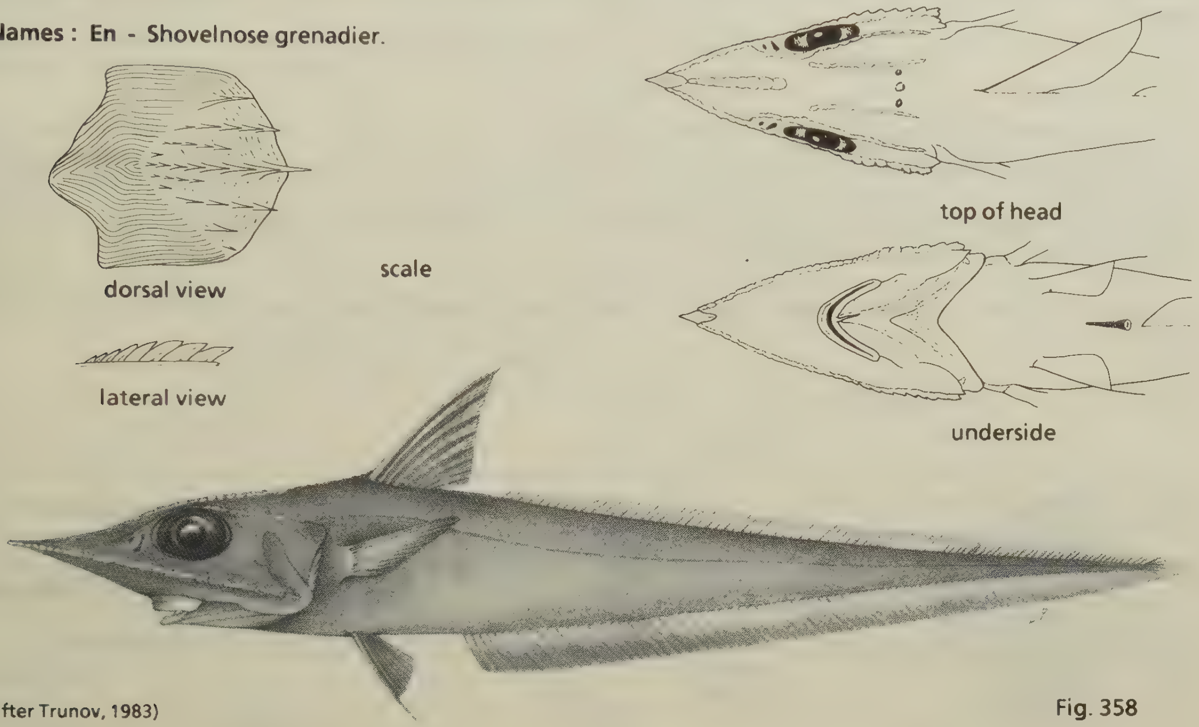
Fig. 358

MACROUR Coel 12

Scientific Name with Reference : ***Coelorhynchus (Oxygadus) braueri*** Barnard, 1925, Ann.Mag.Nat.Hist., ser. 9, 15:501 (Saldanha and Table bays, Cape Point, East London, 457 to 823 m).

Synonyms : ***Macrurus parallelus*** (non Günther, 1877) - Gilchrist, 1904; ***Macrurus (Coelorhynchus) parallelus*** (non Günther, 1877) - Brauer, 1906,; ***Coelorhynchus parallelus*** (non Günther, 1877) - Smith, 1949; ***Coelorinchus braueri*** - Karrer, 1973.

FAO Names : En - Shovelnose grenadier.



(after Trunov, 1983)

Fig. 358

Diagnostic Features : Snout long, pointed, 2.2 to 2.5 times (41 to 47%) in head length, its anterolateral margin incompletely supported by bone; orbit diameter less than snout length, 25 to 35% of head length; upper jaw 21 to 29% of head length; maxillary extends to below posterior 1/4 of orbit; rictus extends to below midorbit; barbel less than 0.4 of orbit; subopercle forms an elongate narrow lobe posteroventrally; teeth uniformly small, in a short broad band in premaxillary, the band extending slightly beyond half the length of rictus; mandibular band long, narrow, extending to end of rictus; inner gill rakers of first arch 1 or 2 + 5 to 7 (7 or 8, rarely 9 total); head ridges strong, demarcated with coarse scutelike scales; post-temporal and supraoccipital scutes developed; underside of head scaled. First dorsal fin with 2 spines and 8 or 9 rays, its height about equal to postrostral length of head; pectoral fin rays i17 to i19. Light organ short, narrow, extends forward to, or short of, midpoint between pelvic fin insertions and anal fin origin; anus slightly removed from anal fin. Body scales large, coarsely covered with 5 to 10 parallel to slightly divergent ridgelike rows of recurved, bladelike spinules; median row largest, lateral rows often falling well short of posterior margin; scale rows below midbase of first dorsal fin 4.5 to 5. Swimbladder weakly bilobate anteriorly, with 4 retia mirabilia. Pyloric caeca 8 to 10. **Colour:** overall pale brownish, fins darker; mouth and gill linings grey to blackish.

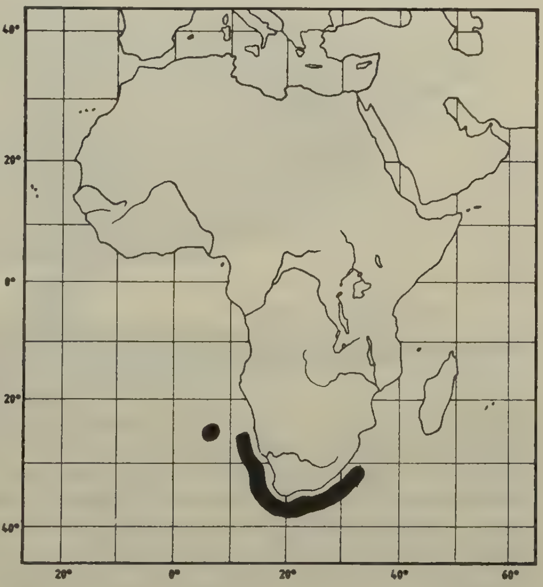


Fig. 359

Geographical Distribution : Apparently confined to both sides of the southern tip of Africa, from Angola to Mozambique (Fig. 359).

Habitat and Biology : Benthopelagic in about 400 to 620 m.

Size : To 40 cm total length.

Interest to Fisheries : A common species off southern Africa, but of no current commercial value.

Local Names : SOUTH AFRICA: Shovel-nose rattail.

Literature : Barnard (1925a, b); Smith (1949); Karrer (1973); Trunov (1983); Iwamoto (in Smith & Heemstra, eds, 1986).

Coelorinchus canus (Garman, 1899)

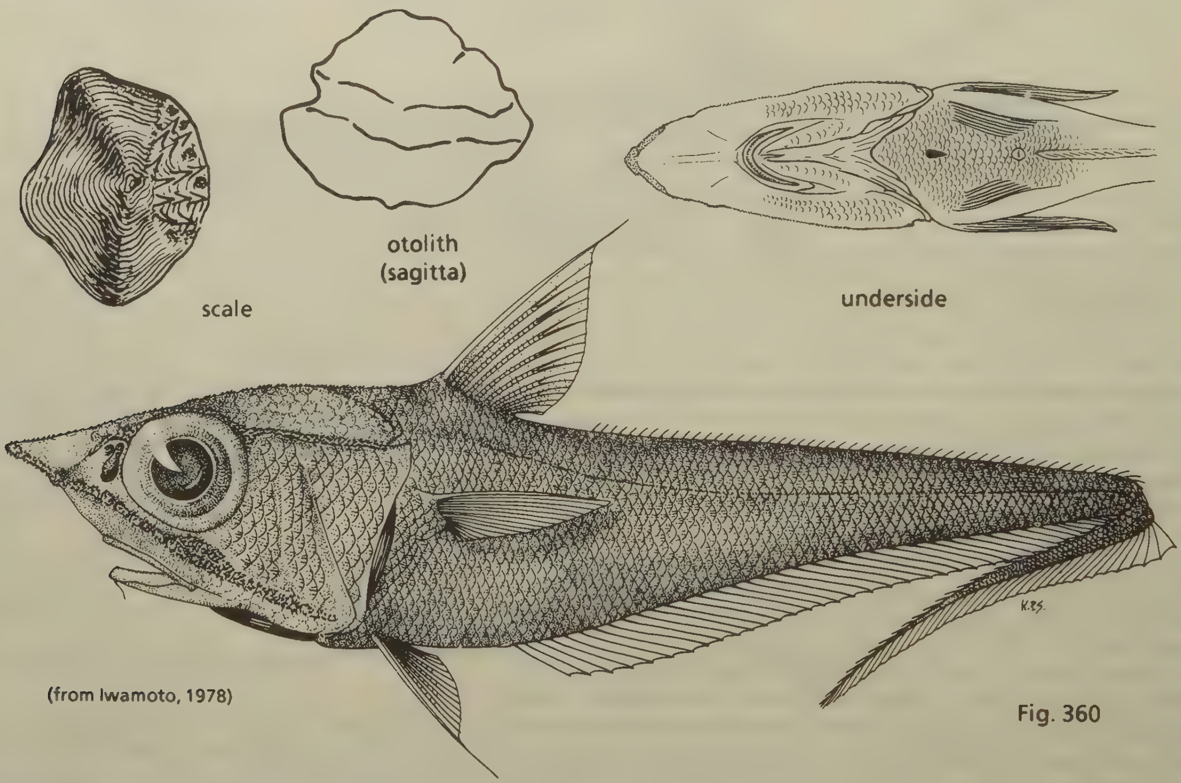
Fig. 360

MACROUR Coel 13

Scientific Name with Reference : ***Macrurus canus*** Garman, 1899, Mem.Mus.Camp.Zool.Harv.Coll., 24:217, pl. 49, fig. 2, pl. 84, figs 1, 2 (Panama, 280 to 384 m).

Synonyms : ***Macrurus (Coelorhynchus) canus*** - Brauer, 1906; ***Coelorhynchus (Coelorhynchus) canus*** - Gilbert & Hubbs, 1916.

FAO Names : En - Clearsnout grenadier.



(from Iwamoto, 1978)

Fig. 360

Diagnostic Features : Snout moderately acute, 29 to 37% of head length, its anterolateral margin incompletely supported by bone; terminal scute broad, blunt, more spiny ventrally than dorsally; orbit 30 to 35% of head length; mouth not notably restricted laterally, upper jaw 24 to 31% of head length; teeth all small, in narrow tapered bands in both jaws; inner gill rakers on first arch 1 to 4 + 8 to 11; head ridges rather weakly scaled, other head scales mostly lacking spinules; dorsal and ventral snout surfaces mostly naked, spinuleless scales on lower jaw and pectoral girdle. First dorsal fin with 2 spines and 8 to 10 rays, its height about equal to or less than postrostral length; pectoral fin rays i17 to i23. Anus immediately before anal fin origin; a large, lens-shaped black fossa of light organ between pelvic fin bases. Head covering thin, mostly transparent. Scales thin, deciduous; body scales with as many as 6 or 7 slightly divergent rows of slender, conical spinules. Swimbladder oval, with 6 to 11 short retia mirabilia and gas glands. Pyloric caeca 10 to 14. **Colour:** light brownish to swarthy overall, somewhat silvery ventrally, punctuations heavy; mouth pale but blackish along tongue base; gill cavity blackish, paler with punctuations toward inner surfaces.

Geographical Distribution : Costa Rica to northern Peru (Fig. 361).

Habitat and Biology : Benthopelagic in 118 to 457 m. Juveniles apparently bathypelagic. Feeds predominantly on copepods and other small crustaceans, but no strictly bottom-dwelling invertebrates in diet.

Size : To at least 23 cm total length.

Interest to Fisheries : Occasionally taken as bycatch of trawlers, but of no commercial value.

Local Names : PERU: Granadero, Ratón.

Literature : Garman (1899); Chirichigno (1974); Iwamoto (1979).

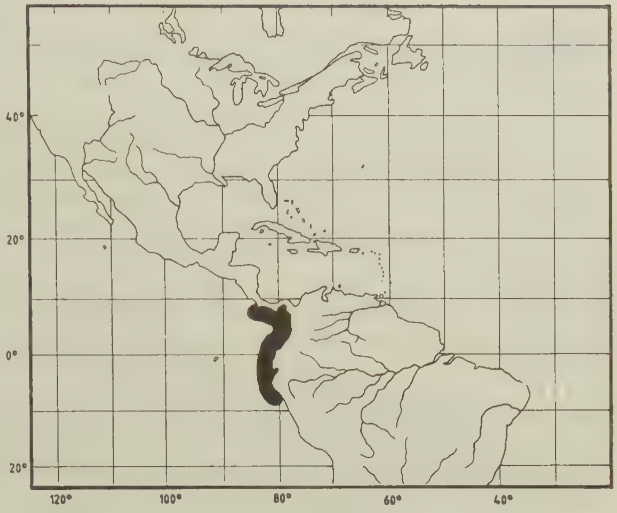


Fig. 361

Coelorinchus caribbaeus (Goode & Bean, 1885)

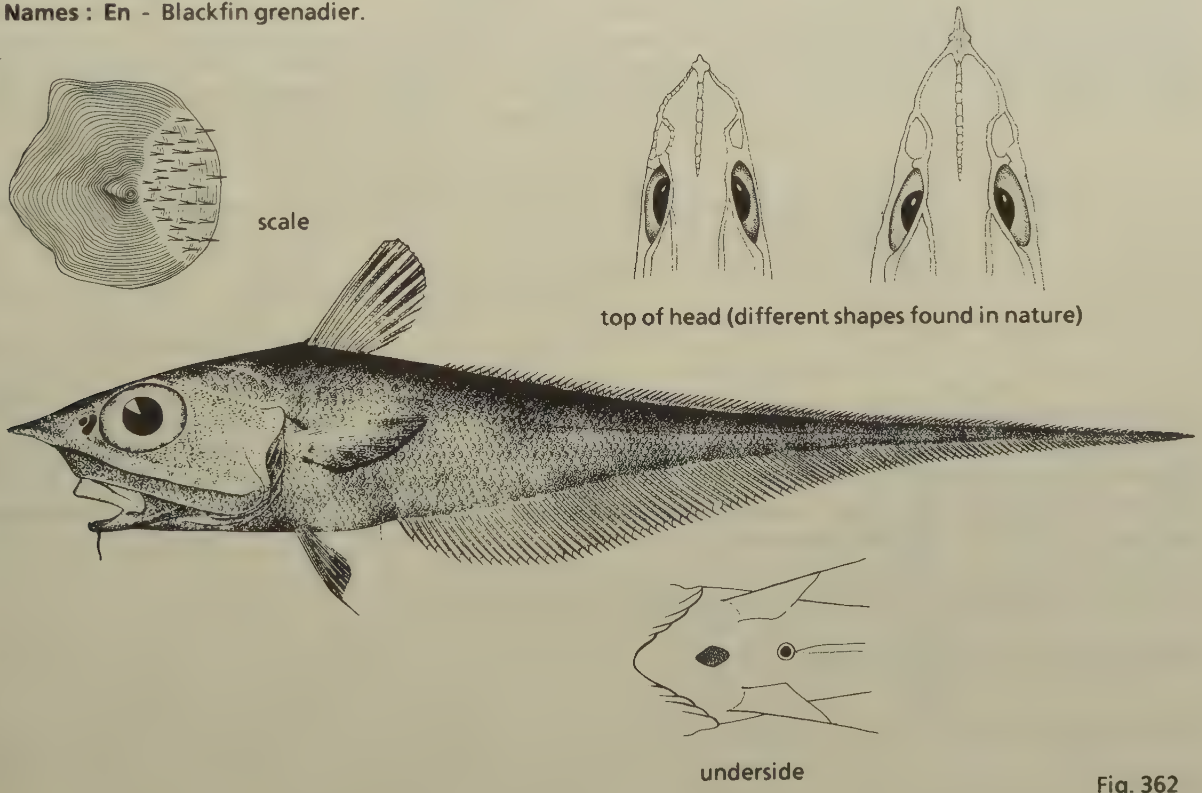
Fig. 362

MACROUR Coel 14

Scientific Name with Reference : ***Macrurus caribbaeus*** Goode & Bean, 1885, Proc.U.S.Natl.Mus., 8:594 (northern Gulf of Mexico, 29°07'30" N, 88°08'W, 384 m).

Synonyms : ***Coelorhynchus caribbaeus*** - Goode & Bean, 1896; ***Coelorhynchus (Coelorhynchus) caribbaeus*** - Gilbert & Hubbs, 1916.

FAO Names : En - Blackfin grenadier.



scale

top of head (different shapes found in nature)

underside

Fig. 362

Diagnostic Features : Snout pointed, prominently so in some individuals, its length highly variable, 37 to 55% of head length, its anterolateral margin incompletely supported by bone; orbits 30 to 34% of head length, slightly larger than upper jaw which is 26 to 30% of head length; gill rakers of first and second arches 9 to 11 total; head ridges stout, but with rather fine spinules; terminal snout scute slender, sharp, and arrowhead-shaped with lateral arms of scute blunt and reduced; underside of snout naked medially; a broad translucent area dorsally on either side of leading snout edge, naked or with thin scales. Subopercle margin rounded, without a posteroventral projection. First dorsal fin with 2 spines and 9 to 11 rays, shorter than postrostral length of head; pectoral fin rays i16 to i19. Anus at origin of anal fin; light organ large, a broadly lenticular to oval black naked fossa between and somewhat anterior to pelvic fin bases. Scales covered with fine conical spinules except posteriorly and ventrally on trunk and tail where spinules are broader; spinules not arranged in any notable pattern; scale rows below second dorsal fin origin 4.5 to 5.5. **Colour:** swarthy overall with a silvery tinge over abdomen and gill covers in fresh specimens; membrane connecting second spinous ray and first branched ray blackish, oral cavity white, except along upper outer facies of premaxillae.

Geographical Distribution : Western tropical Atlantic from Cape Hatteras to northern Brazil. Absent in Straits of Florida, uncommon to the north and along Antillean chain (Fig. 363).

Habitat and Biology : Benthopelagic in 200 to 700 m, but most common in 300 to 400 m.

Size : To about 30 cm total length.

Interest to Fisheries : A common bycatch in trawls fishing for royal red shrimp (***Pleoticus robustus***). Generally taken in large numbers, often with ***C. coelorhincus***, its deeper-living relative.

Local Names : JAPAN: Karibu-hige.

Literature : Goode & Bean (1896); Parr (1946); Marshall & Iwamoto (in Marshall, 1973).

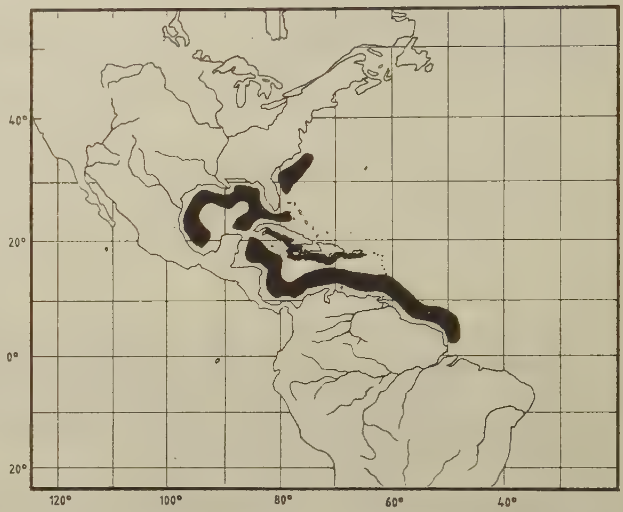


Fig. 363

Coelorinchus chilensis Gilbert & Thompson, 1916

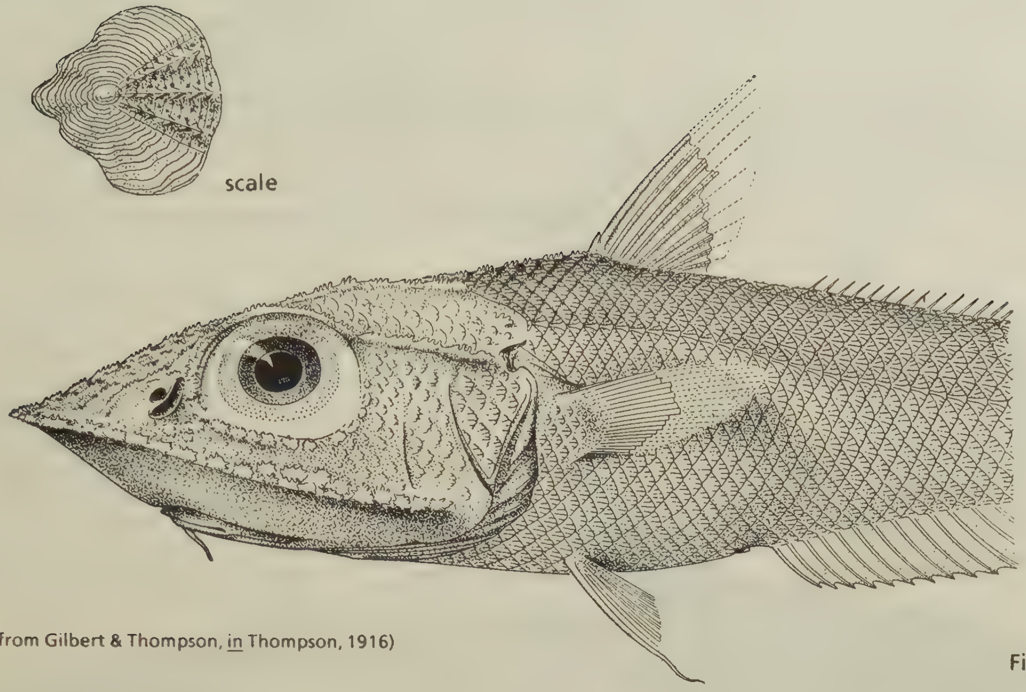
Fig. 364

MACROUR Coel 15

Scientific Name with Reference : ***Coelorhynchus chilensis*** Gilbert & Thompson, in Thompson, 1916, Proc.U.S Natl.Mus., 50:473, pl. 6, fig. 1 (off Lota, Chile, 1 238 m).

Synonyms : ***Coelorhynchus (Oxymacrurus) chilensis*** - Gilbert & Hubbs, 1916.

FAO Names : En - Chilean grenadier.



(from Gilbert & Thompson, in Thompson, 1916)

Fig. 364

Diagnostic Features : Snout moderately long (34 to 40% of head length), acutely pointed, its anterolateral margin incompletely supported by bone; orbits 29 to 38% of head length, usually less than snout length; upper jaw 20 to 29% of head length; teeth small, in broad bands in premaxilla, ending well short of end of rictus; mandibular band narrower, extending to end of rictus, which is restricted posteriorly; inner gill rakers of first arch 1 or 2 + 7 to 9; head ridges strong, conspicuously modified; supraoccipital and post-temporal scutes strong, with a keel-like ridge; underside of head completely naked. First dorsal fin with 2 spines and 7 to 9 rays, its height less than postrostral length of head; pectoral fin rays i16 to i21. Light organ very small, scarcely visible externally as a slightly swollen blackish area before anus. Scales adherent, large, coarsely spinulated with spinules in 3 to 6 divergent rows, the middle row largest; scale rows below midbase of first dorsal fin 3.5 to 5. Swimbladder large, oval; 4 short, slender retia mirabilia. Pyloric caeca 9 to 12. **Colour**: greyish brown overall; head ventrally dirty whitish; fins, mouth, and gill cavities blackish.

Geographical Distribution : Peru (6°26'S) to central Chile (38°08'S) (Fig. 365).

Habitat and Biology : Benthopelagic in 260 to 1 480 m.

Size : To at least 48 cm total length.

Interest to Fisheries : Occasionally taken by commercial trawlers off San Antonio, Chile, but no separate statistics maintained. This species is nowhere found in great abundance.

Literature : Gilbert & Thompson in Thompson (1916); Iwamoto (1978).

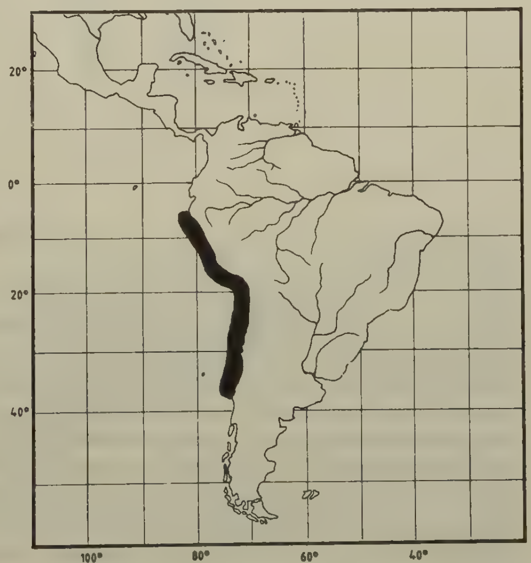


Fig. 365

Coelorinchus coelorhincus (Risso, 1810)

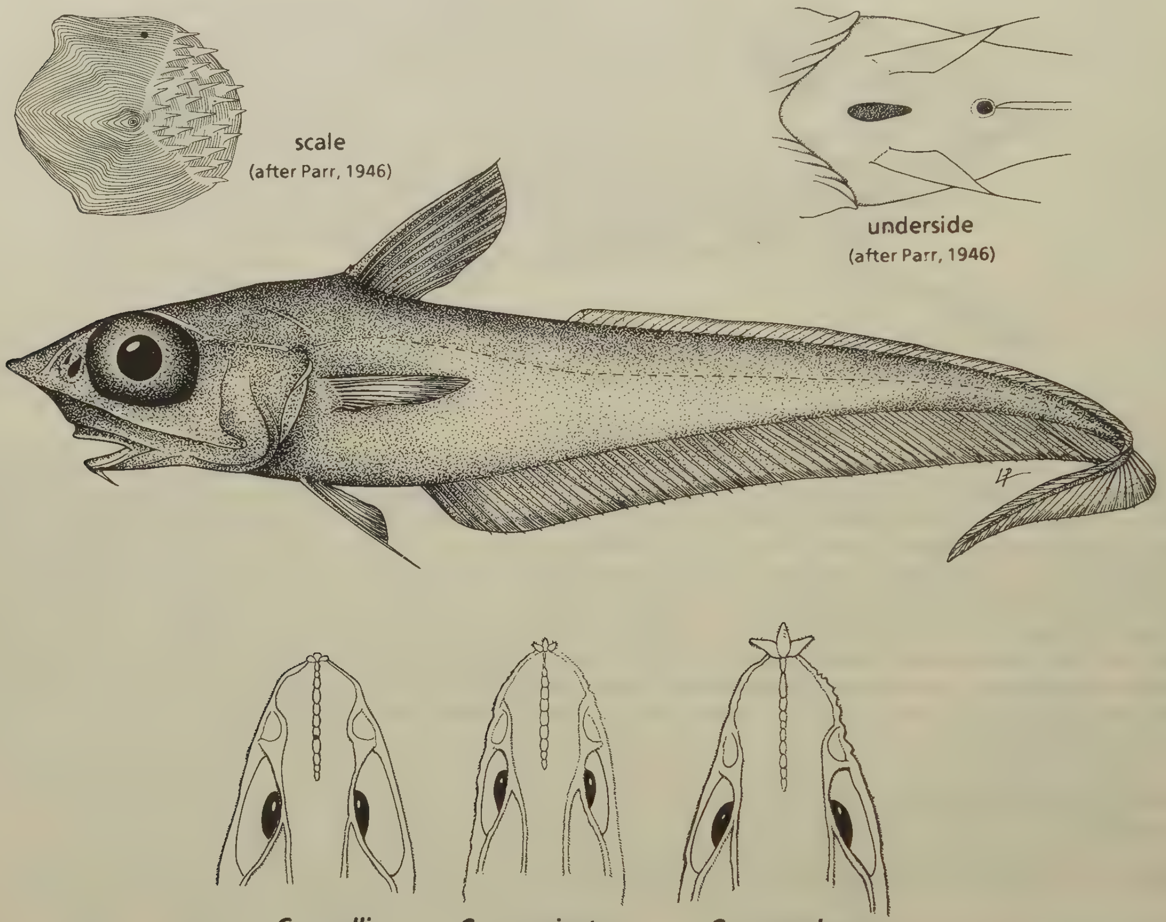
Fig. 366

MACROUR Coel 1

Scientific Name with Reference : ***Lepidoleprus coelorhincus*** Risso, 1810, Ichthyologie de Nice, Paris:200, pl. 7, fig. 22 (Nice).

Synonyms : ***Macrurus coelorhynchus*** - Bonaparte, 1832-41; ***Macrourus rupestris*** (non Bloch) - Lowe, 1839; ***Macrurus (Coelorhynchus) coelorhynchus*** - Günther, 1887; ***Coelorhynchus atlanticus*** - Goode & Bean, 1896; ***Coelorhynchus coelorhynchus*** - Gilbert & Hubbs (1916).

FAO Names : En - Hollowsnout grenadier; **Fr** - Grenadier raton; **Sp** - Granadero acorazado.



scale
(after Parr, 1946)

underside
(after Parr, 1946)

C. c. polli ***C.c. carminatus*** ***C.c. geronimo***

top of head
(after Marshall & Iwamoto, in Marshall, 1973)

Fig. 366

Diagnostic Features : Snout moderately pointed, 29 to 41% of head length, its anterolateral margin incompletely supported by bone; orbits 30 to 40% of head length, usually much larger than upper jaw, which is 24 to 32% of head length; inner gill rakers on first arch 7 to 12 total, on second arch 8 to 11; head ridges strong but with rather fine spinules; terminal snout scute trifid, wider than long, small and blunt to large and pointed, with a terminal and two lateral arms of about equal size. Underside of snout naked medially; a broad area dorsally on either side with thin, finely spinulated scales. Subopercle margin rounded, without a posteroventral projection. First dorsal fin usually with 2 spines and 8 or 9 rays, shorter than postrostral length of head; pectoral fin rays usually i16 to i19. Anus at origin of anal fin; light organ large, a prominent black naked fossa between and somewhat anterior to pelvic fin bases. Scales covered with fine conical spinules arranged in basically quincunx pattern; scale rows below second dorsal fin origin 4 to 6. **Colour:** pale greyish-brown to swarthy, a series of broad saddle marks in some; oral cavity pale to dark, branchial cavity blackish; first dorsal and pectoral fins dusky; pelvic fins black with pale outer ray; anal fin edged with black stripe in some individuals.

Geographical Distribution : Western Atlantic from about 45°N to 7°N; eastern Atlantic from about 60°N to 18°S; also around the Azores (Fig. 367)

Habitat and Biology : Benthopelagic in about 200 to 500 m, but has been captured as shallow as 90 m and as deep as 850 m. In the Straits of Messina, it spawns from December to March. Feeds on a variety of predominantly benthic organisms, such as polychaetes, gastropods, cephalopods, numerous crustacea groups (copepods, gammarians, isopods, cumaceans, Natantia) and fish.

Size : To at least 38 cm total length.

Interest to Fisheries : A common bycatch in trawls operating deeper than 200 to 400 m (depending on locality) throughout its range. Reported to be abundant in some localities off West Africa. Often taken in moderate quantities, mostly reduced to fishmeal and oil. Separate catch statistics are not kept for the species.

Local Names : CANADA: Grenadier à long nez, Longnose grenadier; JAPAN: Fuda-sokodara.

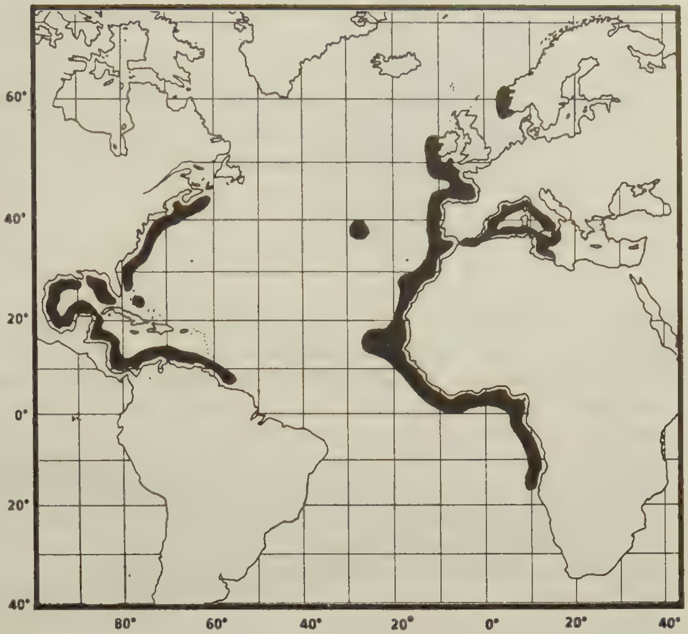


Fig. 367

Literature : Marshall & Iwamoto (in Marshall, 1973); Geistdoerfer (1978a).

Remarks : Four subspecies are recognized; ***coelorhincus*** (eastern North Atlantic and Mediterranean), ***carminatus*** (western North Atlantic), ***geronimo*** (Gulf of Guinea), ***polli*** (Namibia).

Coelorinchus denticulatus Regan, 1921

Fig. 368

MACROUR Coel 16

Scientific Name with Reference : ***Coelorhynchus denticulatus*** Regan, 1921, Ann.Mag.Nat.Hist., ser. 9, 7:412 (Natal, South Africa).

Synonyms : ***Coelorhynchus (Paramacrurus) denticulatus*** - Barnard, 1925b; ***Coelorhynchus (Paramacrurus) natalensis*** Fowler, 1925.

FAO Names : **En** - Filesnout grenadier.

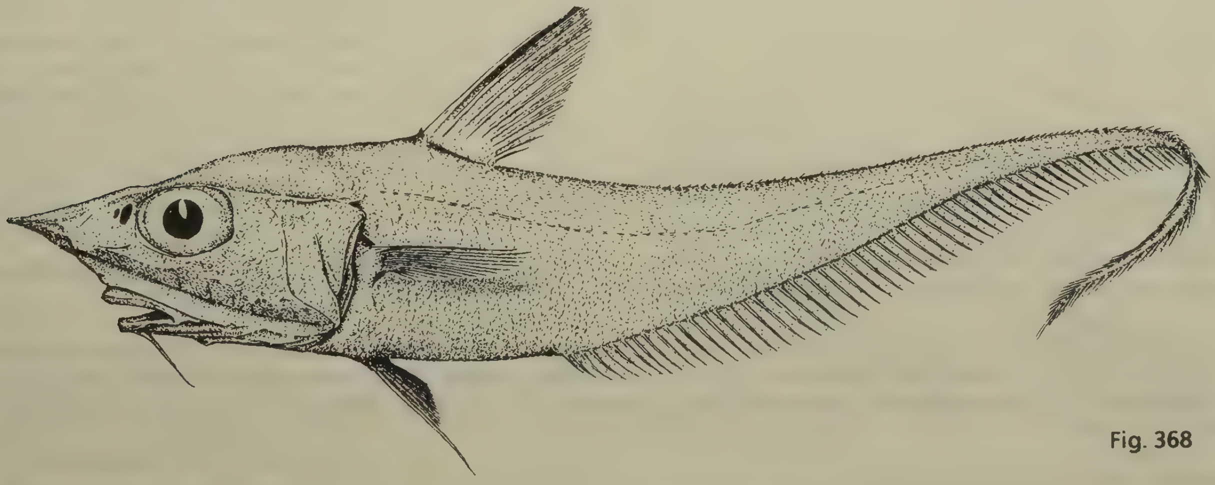
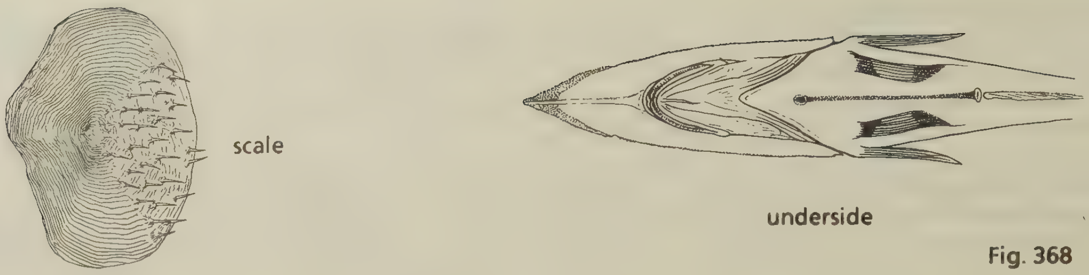


Fig. 368

(from Iwamoto, in Smith & Heemstra, 1986)



scale

underside

Fig. 368

Diagnostic Features : Snout long, sharply pointed, 2.3 to 2.6 in head length, its anterolateral margin incompletely supported by bone; orbit diameter less than snout length, 38 to 43% of head length; upper jaw 28 to 31% of head length, the maxillary extending to below posterior 1/4 of orbits; rictus extending to below midorbit; barbel more than half the orbit diameter; teeth uniformly small, in long narrow bands that extend to end of rictus; inner gill rakers on first arch 1 or 2 + 6 to 8 (8 or 9 total); underside of head completely naked; broad areas dorsally on snout, around nostrils, and antero-dorsally on suborbital naked or covered with thin scales; head covering thin, translucent to transparent, scales of head ridges finely spinulated; characteristic scales ventrally along leading edge of snout. First dorsal fin with 2 spines and 8 or 9 rays, its height about equal to postrostral length of head; pectoral fin rays i14 or i15. Light organ long, extending as a dark streak from anus to chest, expanded at each end, scales cover anterior fossa. Body scales finely covered with slender, conical spinules in subparallel to quincunx pattern; scale rows below midbase of first dorsal fin 4 or 5. Pyloric caeca 10 to 12. **Colour:** light brownish to grey-brown overall; faint diagonal bands in some individuals; snout tip and median process of nasal bone blackish; premaxillary and tip of lower jaw blackish; mouth generally pale, gill cavity pale on inner lining, darker peripherally; first dorsal fin with a dark band across middle; membrane behind second spine blackish; pelvic fin black-tipped, its base blackish.

Geographical Distribution : Western Indian Ocean; Kenya south to Natal coast of South Africa (Fig. 369).

Habitat and Biology : Benthopelagic in 64 to 275 m.

Size : To 27 cm total length.

Interest to Fisheries : A common species off southeastern coast of Africa, but of no current commercial value.

Literature : Regan (1921); Fowler (1925); Smith (1949); Iwamoto (in Smith & Heemstra, eds, 1986).

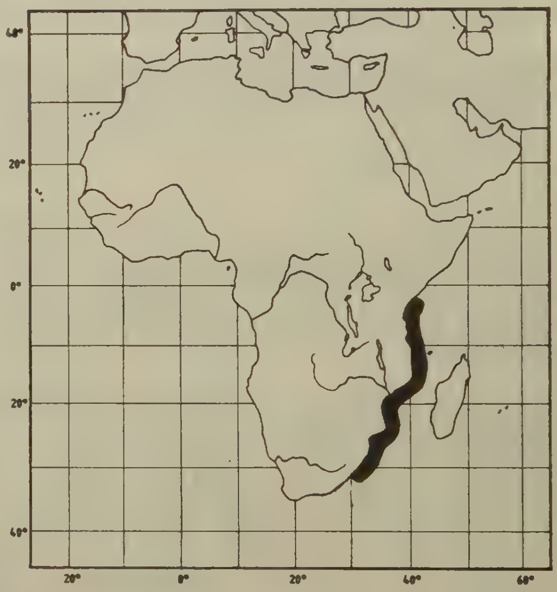


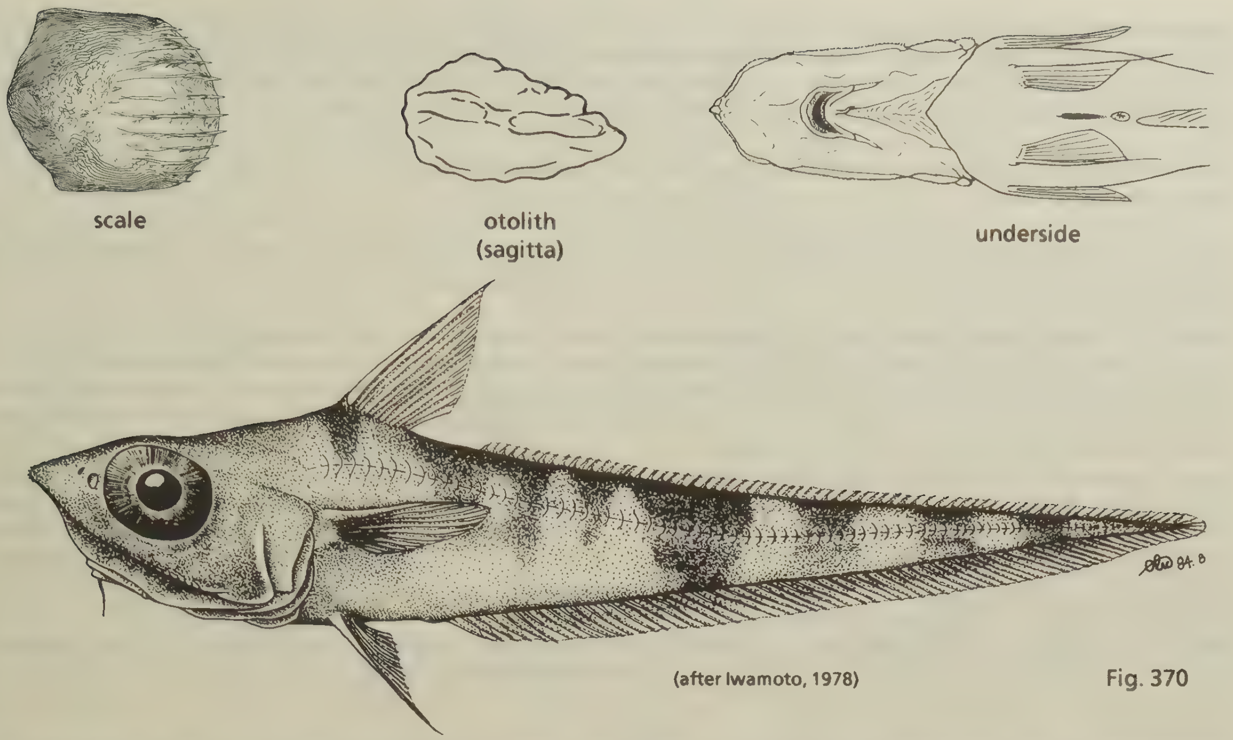
Fig. 369

Coelorinchus fasciatus (Günther, 1878) Fig. 370 **MACROUR Coel 2**

Scientific Name with Reference : ***Macrurus fasciatus*** Günther, 1878, Ann.Mag.Nat.Hist., ser. 5, 2:24 (east coast of southern tip of South America; CHALLENGER sta. 305, 309, 311; 73 to 448 m).

Synonyms : ***Macrurus (Coelorhynchus) fasciatus*** - Günther, 1887; ***Coelorhynchus fasciatus*** - Goode & Bean, 1896; ***Coelorhynchus (Paramacrurus) fasciatus*** - Gilbert & Hubbs, 1916; ***Coelorhynchus patagoniae*** Gilbert & Thompson in Thompson, 1916; ***Coelorhynchus (Coelorhynchus) patagoniae*** - Gilbert & Hubbs, 1916; ***Garichthys fasciatus*** - Whitley, 1968.

FAO Names : En - Banded whiptail.



(after Iwamoto, 1978)

Fig. 370

Diagnostic Features : Snout short (29 to 33% of head length), bluntly conical, its anterolateral margin incompletely supported by bone; orbits large, about 39 to 46% of head length; upper jaws 25 to 31% of head length; teeth all small, in broad bands, premaxillary band shorter than mandibular bands, the former falling well short of end of rictus (which is posteriorly restricted by lip folds); inner gill rakers on first arch 7 to 9; head ridges moderately developed, not markedly spiny or sharp; underside of head completely naked. First dorsal fin with 2 spines and 9 or 10 rays, greatest height about equal to postrostral length of head; pectoral fin rays i15 to i19. Light organ moderately large, its length more than half of pupil diameter; lens-shaped fossa immediately before anus, extending to more than half distance to pelvic fin bases. Scales large, adherent, spinules small, imbricate, closely packed, in sharp low parallel rows, 15 or 16 rows in largest specimens. Scales below midbase of first dorsal fin about 4 to 5.5. Pyloric caeca long, 15 to 19. Swimbladder deeply bilobed anteriorly, with 4 to 6 (usually 4) small rete-gas gland combinations. **Colour:** swarthy overall, pale ventrally, dorsally marked with 8 to 10 broad saddles or bars that extend slightly below lateral line but not to ventral profile except posteriorly on tail; saddles sometimes faint; fins dusky except for whitish outermost pelvic ray; mouth and gill cavities grey to black.

Geographical Distribution : Southern Africa, southern tip of South America, New Zealand, Tasmania, southern Australia (Fig. 371).

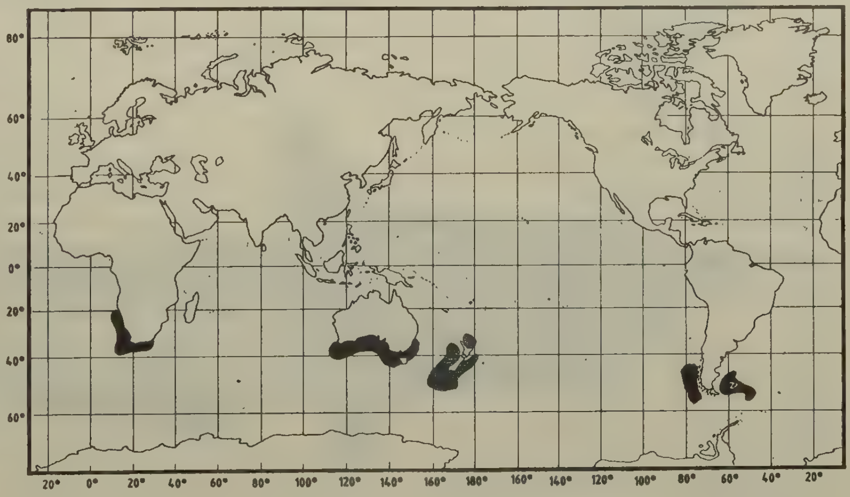


Fig. 371

Habitat and Biology : Benthopelagic in 73 to 1 086 m, but most abundant in 400 to 800 m. Off Cape Point (South Africa), it spawns from July to September. Feeds on copepods, polychaetes, gastropods and bivalve molluscs, amphipods, and decapod crustaceans, echinoderms and fishes (myctophids and ***Maurolicus***).

Size : To at least 45 cm total length.

Interest to Fisheries : Taken in considerable quantities as bycatch of commercial trawlers along the edges of continental slopes in different regions. Off Patagonia and South Africa, ***C. fasciatus*** is taken along with the commercially important stockfish

(***Merluccius***), and Gilchrist (1922) has reported that the species "occurs in very large quantities, from about 100 to 300 fathoms, and some of the trawlers have procured several tons of this fish in a single haul". Last et al. (1983) report that in the Australian region, "the species is seldom eaten although the flesh is reported to be quite tasty". Off New Zealand it is an important food item of the ling (***Genypterus blacodes***) (Mitchell, 1984).

Local Names : AUSTRALIA: Banded whiptail, Striped whiptail; SOUTH AFRICA: Banded rattail; USSR: Dolgokhvost polosatyi.

Literature : Günther (1887); Waite (1911); Smith (1949); Iwamoto (1978); McCann & McKnight (1980); Last et al. (1983).

Remarks : Several species have apparently been confused with this species, and the taxonomic problems have yet to be fully resolved. One or more of Iwamoto's (1978) "forms" probably represent distinct species, especially the Namibia (South-West Africa) and South African populations. Last et al. (1983) report that two or more closely related forms occur in the Australasian region and are currently being revised. Workers from southern Africa may have confused more than one species with ***C. fasciatus*** - a specimen (RUSI 10322) identified as that species was actually a large ***C. matamua***. Barnard's (1925b) report of 50 cm as maximum size is probably too large for ***C. fasciatus*** but well within the range of ***C. matamua***. The present author was unable to distinguish ***C. cookianus*** from ***C. fasciatus*** based on McCann & McKnight's descriptions of the two species, but Peter McMillan (personal communication) provided distinguishing features and noted that the specimen illustrated by McCann & McKnight (Fig. 65), as their holotype is not the same as the one deposited in the New Zealand Oceanographic Institute as the holotype. In fact, that figured specimen represents an undescribed species. For reasons unknown, McCann & McKnight placed their two new species (***C. cookianus*** and ***C. bollonsi***) in the subgenus ***Oxymacrurus***, although their diagnosis of the subgenera clearly places them along with ***C. fasciatus***, in the subgenus ***Paramacrurus.***

Coelorinchus formosanus Okamura, 1963

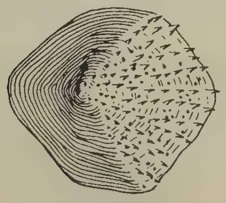
Fig. 372

MACROUR Coel 17

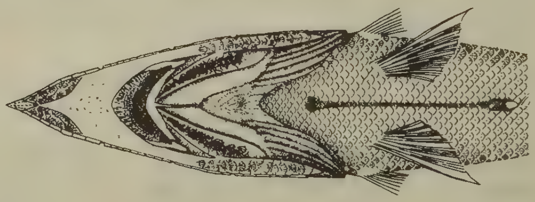
Scientific Name with Reference : ***Coelorhynchus formosanus*** Okamura, 1963 (March, Bull.Misaki.Mar. Biol.Inst., 4:37, figs 1-2 (Tashi, Taiwan Island).

Synonyms : ***Coelorhynchus intermedius*** Chu & Lo, 1963 (August, not seen); ***Coelorhynchus abbreviatus*** Chu & Lo, 1963 (August, not seen).

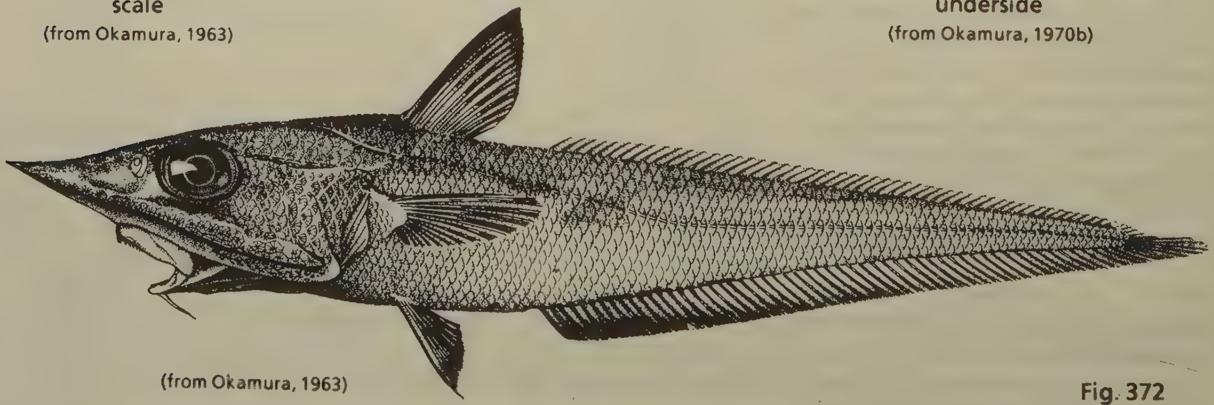
FAO Names : En - Formosa grenadier.



scale
(from Okamura, 1963)



underside
(from Okamura, 1970b)



(from Okamura, 1963)

Fig. 372

Diagnostic Features : Snout moderately long (43 to 45% of head length), sharply pointed, anterolateral margin incompletely supported by bone; orbit (23 to 26% of head length) less than snout length, about 2/3 of postorbital length; upper jaw (27 to 29% of head length) extends to below posterior margin of orbit, rictus extends to posterior 1/4 of orbits; barbel 1.7 to 2.1 times into orbit; premaxillary teeth in 7 or 8 irregularly oblique series forming a tapered band extending to near end of rictus; outer series enlarged; mandibular teeth in 3 or 4 irregular series; inner gill rakers on first arch 1 or 2 + 6 or 7; head ridges well developed but not especially coarse; underside of head mostly naked except on mandibular rami, and posteriorly from end of premaxilla to end of preopercle, and anterolateral margin of snout, where characteristic scales prevail; nasal fossa and crescentic area above anterolateral edges of snout naked. First dorsal fin with 2 spines and 8 to 10 rays, its height less than postrostral length of head; pectoral fin rays i15 to i18. Light organ long, extends as a black streak from anus to just behind isthmus, expanded at each end but lacking a scaleless fossa. Scales of body with short, sharp, triangular spinules arranged in irregularly quincunx pattern to subparallel rows; scale rows below midbase of first dorsal fin 3.5 to 4.5. **Colour:** greyish dorsally, silvery ventrally; dorsally on trunk and tail with irregular blotches, mouth lining whitish, gill cavity dusky; paired black papillae on underside of head; second spinous ray and membrane between spine and first segmented ray of first dorsal fin blackish; pelvic and anal fin rays blackish distally.

Geographical Distribution : East China Sea around Taiwan Island and off southern Japan (Fig. 373).

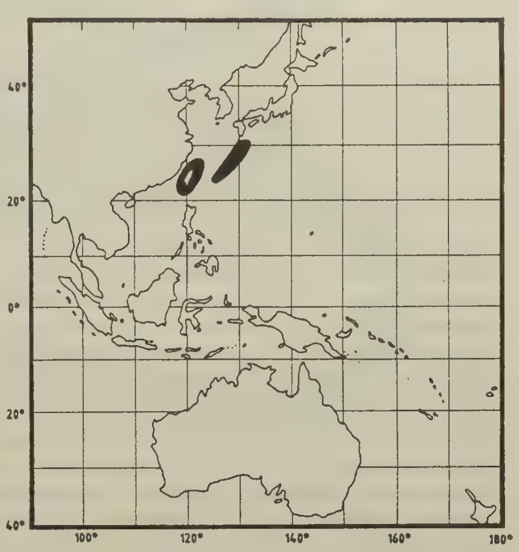


Fig. 373

Habitat and Biology : Benthopelagic in about 200 to 300 m depth.

Size : To 25 cm total length.

Interest to Fisheries : Occasionally taken by trawlers, but no catch statistics kept.

Local Names : JAPAN: Taiwan-sokodara.

Literature : Okamura (1963, 1970a).

Remarks : According to Okamura, 1970a, page 161, the original descriptions of ***C. intermedius*** and ***C. abbreviatus*** were published in August of 1963. They were predated by Okamura's description of ***C. formosanus***, which was published in March, 1963.

Coelorinchus hexfasciatus Okamura, 1982

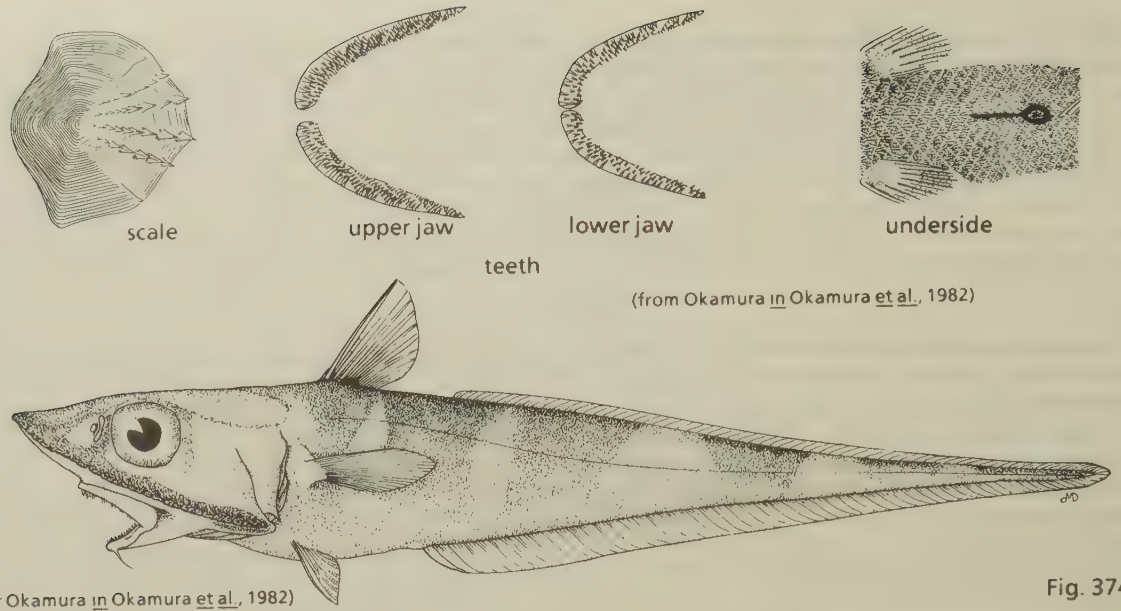
Fig. 374

MACROUR Coel 18

Scientific Name with Reference : ***Coelorinchus hexfasciatus*** Okamura, 1982, Fishes of the Kyushu-Palau Ridge and Tosa Bay, p. 172 (Kyushu-Palau Ridge, 26°45'N, 135°19'E, 336 m).

Synonyms : None

FAO Names : **En** - Six-band grenadier.



(from Okamura in Okamura et al., 1982)

(after Okamura in Okamura et al., 1982)

Fig. 374

Diagnostic Features : Head large, less than 4 times in total length; snout moderately long (37 to 41% of head length), and tipped with a blunt tricuspid tubercle, its anterolateral margin incompletely supported by bone; orbit diameter 23 to 27% of head length; interorbital space 21 to 25% of head length, usually narrower than orbit diameter; mouth large, upper jaw 28 to 35% of head length, maxillary bone extends to below posterior end of orbit; barbel short, about 1/3 to 1/2 of orbit diameter; subopercle ends in a narrow protuding tip; teeth in long, rather broad bands in both jaws; inner gill rakers on first arch 1 to 3 + 6 to 8; head ridges well developed; underside of head naked except for a small patch below preopercular angle. First dorsal fin with 2 spines and 8 or 9 rays, its height much less than postrostral length of head; pectoral fins rays i16 to i20. Light organ small, externally apparent as a narrow blackish streak extending forward of anus to about midway between pelvic fin insertions and anal fin origin. Body scales with 4 to 7 divergent rows of stout, broad spinules, the lateral rows lower than median one; scale rows below midbase of first dorsal fin 6.5 to 8.5. Swimbladder large, strongly bilobed anteriorly, with 4 retia mirabilia. Pyloric caeca about 54. **Colour:** greyish brown; abdominal region bluish; 6 or 7 broad saddle marks on body extending below lateral line (more prominent in young); fins blackish except for whitish base of first dorsal and basally on anal in some individuals; mouth and gill cavities black.

Geographical Distribution : Kyushu-Palau Ridge (Fig. 375).

Habitat and Biology : Benthopelagic in 336 to 910 m.

Size : To at least 62 cm total length.

Interest to Fisheries : Because of its size and because it seems to co-occur with its even-larger close relative, ***C. longicephalus***, the species may offer some potential for commercial exploitation.

Local Names : JAPAN: Musuji-sokodara.

Literature : Okamura, Amaoka & Mitami, eds (1982).

Remarks : The description and illustrations are from Okamura's (1982) original description. Additional non-type specimens from the Kyushu-Palau Ridge were examined by the present author at Hokkaido University. The species is closely related to ***C. longicephalus, C. tokiensis, and C. quadricristatus***, the four constituting a natural group, according to Okamura (1982:178). ***C. hexfasciatus*** differs from ***C. longicephalus*** in having a shorter snout (2.4 to 2.7 times in head length compared with 2.2 to 2.3 in ***C. longicephalus***) and a longer orbit (3.7 to 4.3 times in head length compared with 4.6 to 4.9). The snout profile and markings on the body also differ between the two. ***C. tokiensis*** differs slightly from ***C. hexfasciatus*** in orbit diameter (4.3 to 4.6 times in head length), head length (3.5 to 3.7 times in total length compared with 3.4 to 4.1 in ***hexfasciatus***), and body depth (7.5 to 8.2 times in total length compared with 6.1 to 7.4). ***C. quadricristatus*** from the Indian Ocean is readily distinguished from the other three in having a completely scaled underside of head.

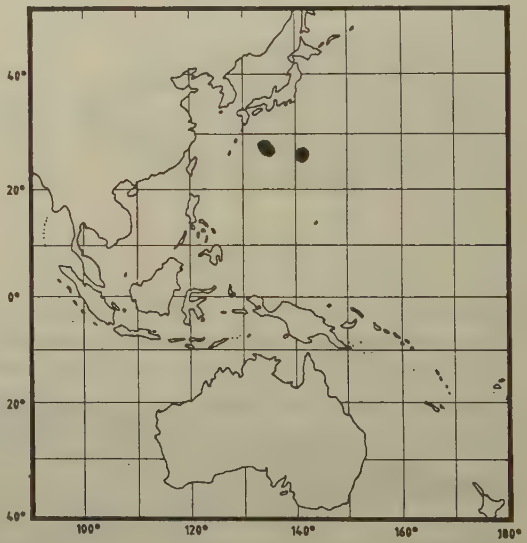


Fig. 375

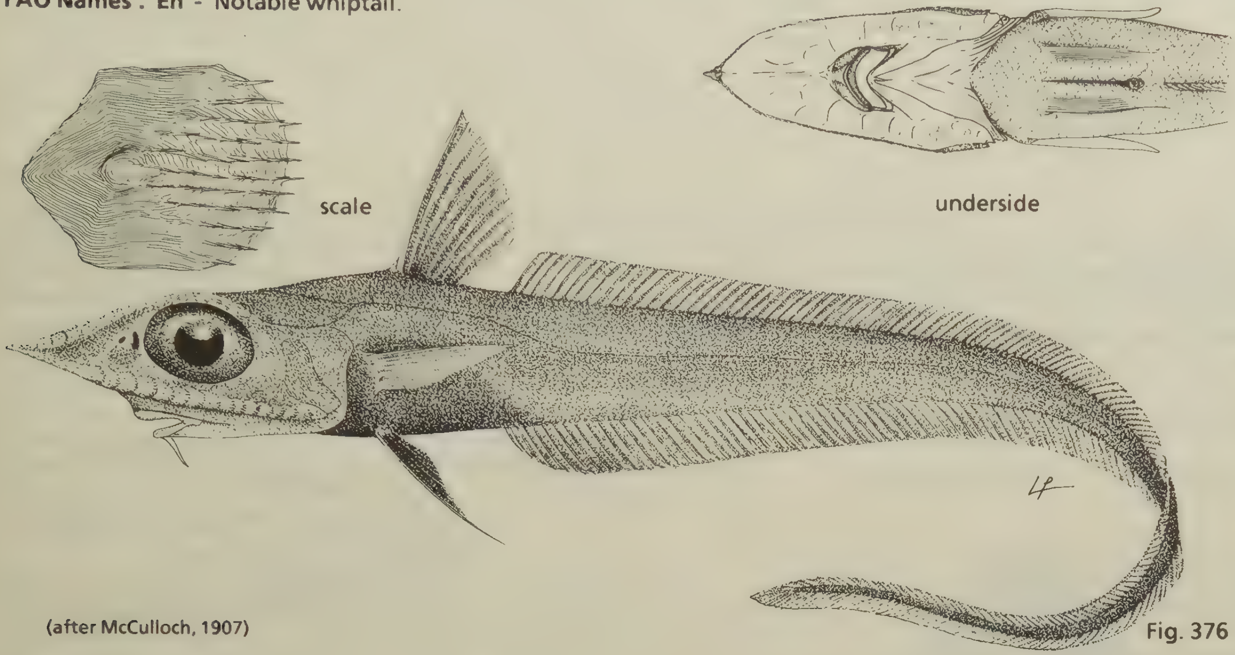
Coelorinchus innotabilis McCulloch, 1907

Fig. 376

Scientific Name with Reference : ***Coelorhynchus innotabilis*** McCulloch, 1907, Rec.Austr.Mus.Sydney, 6:348, pl. 63, figs 2, 2a (56 km east of Sydney, 1 463 m).

Synonyms : None

FAO Names : En - Notable whiptail.



(after McCulloch, 1907)

Fig. 376

Diagnostic Features : Snout long (40 to 46% of head length), sharply pointed, dorsal profile concave, its anterolateral margin sharp, completely supported by bone; orbits 29 to 34% of head length; upper jaw 19 to 22% of head length; barbel 5 to 9% of head length; teeth small, in broad bands in both jaws; premaxillary band short, falling well short of posterior mouth angle; mandibular band long, tapering to few teeth, wide posteriorly, ending at mouth angle; inner gill rakers on first arch 1 or 2 + 6 or 7; head ridges narrow and sharp, no supraoccipital scutes; post-temporal scute developed; underside of head mostly naked although small, thin, deciduous, non-spinulated scales are clustered near mouth and onto preopercle; area located dorsally behind anterolateral margins of snout generally naked or with thin cycloid scales. First dorsal fin with 2 spines and 9 or 10 rays, its height less than postrostral length of head; pectoral fin rays i15 to i19. Light organ small, not readily visible from exterior, connected to periproct by a short stalk, much closer to pelvic fin insertions than to anal fin origin; anus slightly removed from anal fin origin. Scales large, fairly deciduous, covered with small, sharp, reclined spinules aligned in about 4 to 14 essentially parallel rows; scale rows below midbase of first dorsal fin 4.5 to 6. Swimbladder large, oval; 4 large retia mirabilia. Pyloric caeca 7 to 12. **Colour:** overall pale ochre; fins dusky to blackish (pelvics); abdomen bluish below upper level of pectoral fin base; mouth and gill cavities black.

Geographical Distribution : Tasmania, southeast Australia (NSW), New Zealand (Fig. 377).

Habitat and Biology : Benthopelagic in 554 to 1 463 m. Feeds on gastropods, bivalves, polychaetes, and percarid crustaceans. Near-ripe ova were found in a specimen taken in late March (McCann & McKnight, 1980).

Size : To at least 32 cm total length.

Interest to Fisheries : Common in trawl catches between 600 and 1 000 m off Tasmania.

Local Names : AUSTRALIA: Longnose rattail, Notable whiptail.

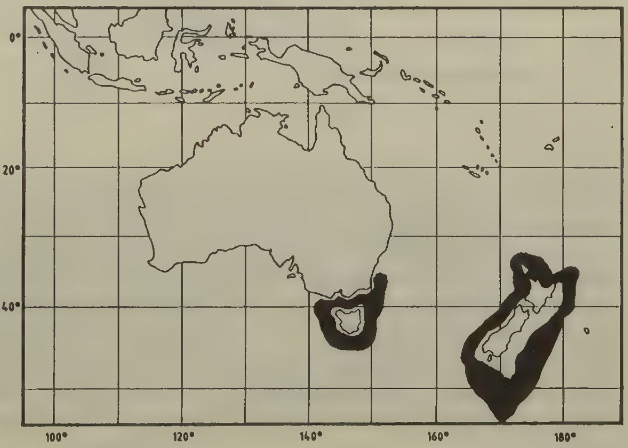


Fig. 377

Literature : Iwamoto (1978, in part); McCann & McKnight, 1980; Last et al. (1983: fig. 21.14 from Iwamoto, 1978, represents an undescribed species).

Remarks : The Chilean specimen that Iwamoto (1978:329) reported under this name actually represents a closely related, but undescribed species. Two specimens of ***C. kaiyomaru*** Arai & Iwamoto, 1979, were also mixed with Iwamoto's material. ***C. karrerae*** Trunov, 1984 is a closely related species that differs chiefly in its more attenuated snout.

Coelorinchus japonicus (Temminck & Schlegel, 1842)

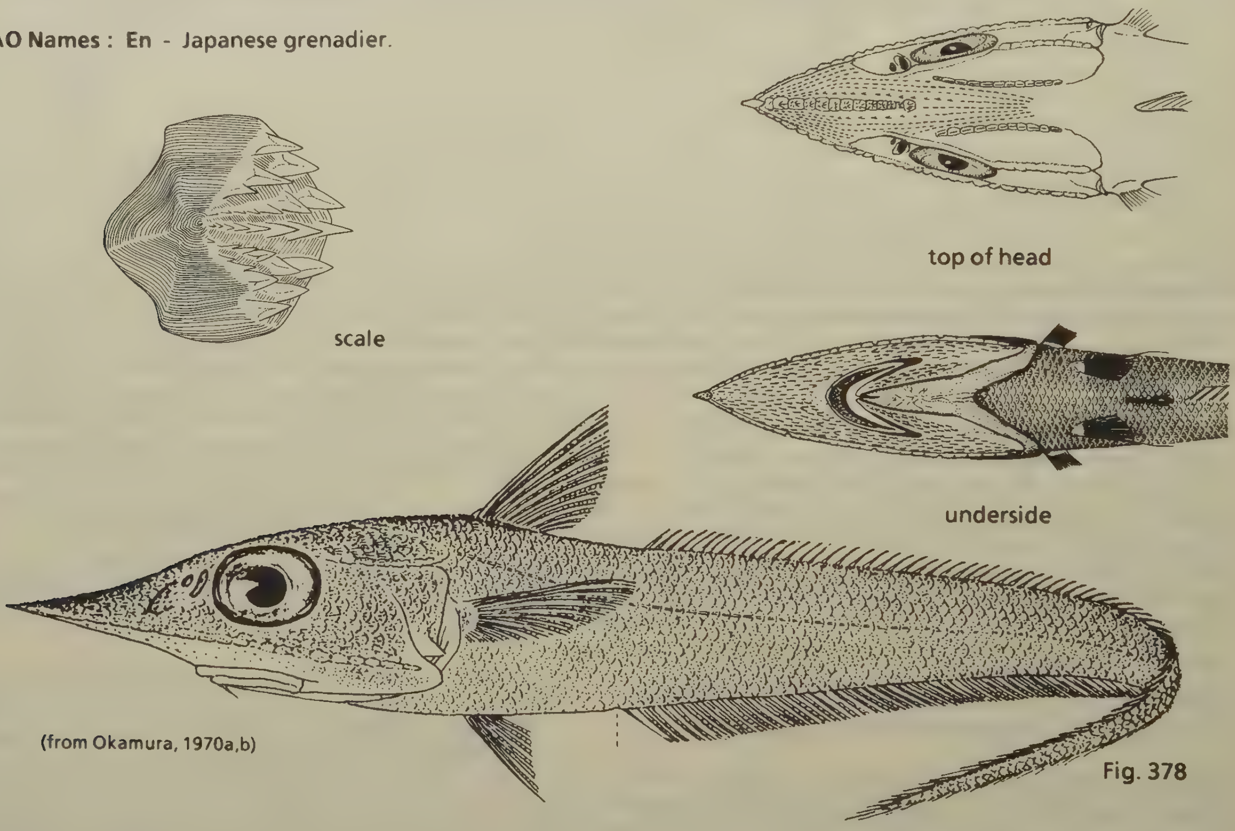
Fig. 378

MACROUR Coel 20

Scientific Name with Reference : ***Macrurus japonicus*** Temminck & Schlegel, 1842, Pisces in Von Siebold, Fauna Japonica 2:256 (Japan).

Synonyms : ***Coelorhynchus japonicus*** - Jordan & Gilbert, 1904.

FAO Names : **En** - Japanese grenadier.



scale

top of head

underside

(from Okamura, 1970a,b)

Fig. 378

Diagnostic Features : Snout long, sharply pointed, 42 to 44% of head length, its anterolateral margin completely supported by bone; orbit 21 to 26% of head length, somewhat shorter than upper jaw, which is 29 to 34% of head length; inner gill rakers on first arch 0 to 2 + 5 to 7; head ridges prominently demarcated by stout, spiny scales; supraoccipital ridge developed; most head scales with single ridge of sharp spinules; underside of head scaled. First dorsal fin with 2 spines and 8 to 10 rays, its height less than postrostral length of head; pectoral fin rays i17 to i19. Light organ short, 2.4 to 4.1 times into orbit. Body scales rather small, covered with 3 to 6 divergent, keel-like rows of imbricate spinules, the posteriormost in the middle row usually largest and with 3 struts; scale rows below midbase of first dorsal fin 5.5 to 6.5. Pyloric caeca 41 to 60. **Colour:** greyish to brownish, without prominent markings; mouth cavity grey; gill cavities and distal third of first dorsal fin blackish.

Geographical Distribution : Southern Japan (and possibly much wider) (Fig. 379).

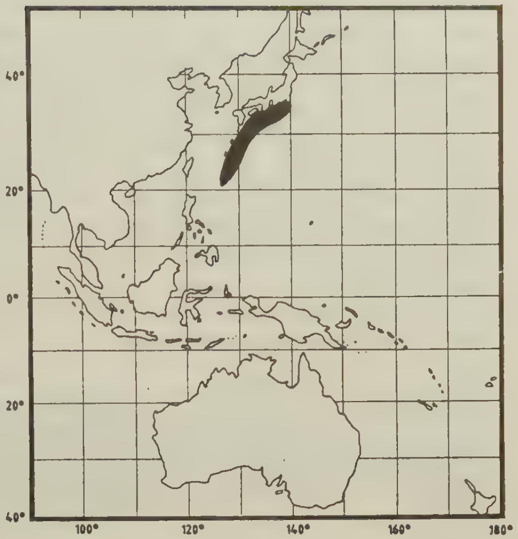


Fig. 379

Habitat and Biology : Benthopelagic in 300 to 1 000 m, with larger fish in deeper waters. Feeds on euphausiids, prawns, benthic fishes, isopods, and polychaetes. Spawning season apparently in early spring, when mature fish believed to migrate to shallower waters.

Size : To 75 cm total length.

Interest to Fisheries : Taken by trawlers, but no separate catch statistics recorded.

Local Names : JAPAN: Tojin.

Literature : Günther (1887); Steindachner & Döderlein (1887); Jordan & Gilbert (1904); Okamura (1970).

Remarks : Okamura (1970:186) and subsequent authors give the distribution as wide ranging"....throughout the tropic and subtropic regions of Indo-western Pacific," but the author found no references to specimens that would support such a distribution. His search of the literature revealed supportive material only from off southern Japan and possibly to the Kyushu-Palau Ridge (Okamura et al., 1982). Weber's (1913) specimens of "***Coelorhynchus japonicus***" from SIBOGA expeditions to the East Indies have been attributed to ***C. acantholepis*** Gilbert & Hubbs, 1920.

Coelorinchus kaiyomaru Arai & Iwamoto, 1979

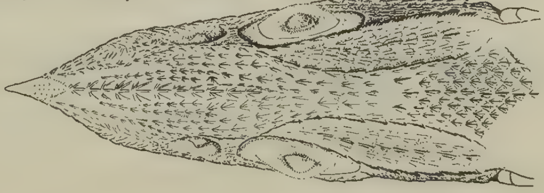
Fig. 380

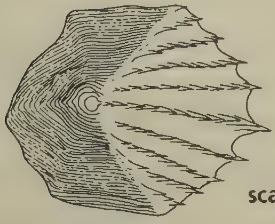
MACROUR Coel 21

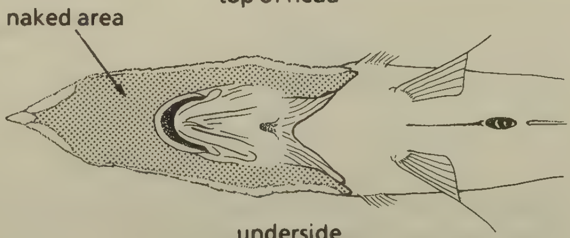
Scientific Name with Reference : ***Coelorinchus kaiyomaru*** Arai & Iwamoto, 1979, Japan.J.Ichthyol., 26(3):238 (Chatham Rise, east of New Zealand, 1 006 to 1 050 m).

Synonyms: ***Coelorinchus innotabilis*** (non McCulloch, 1907)-Iwamoto, 1978 (in part).

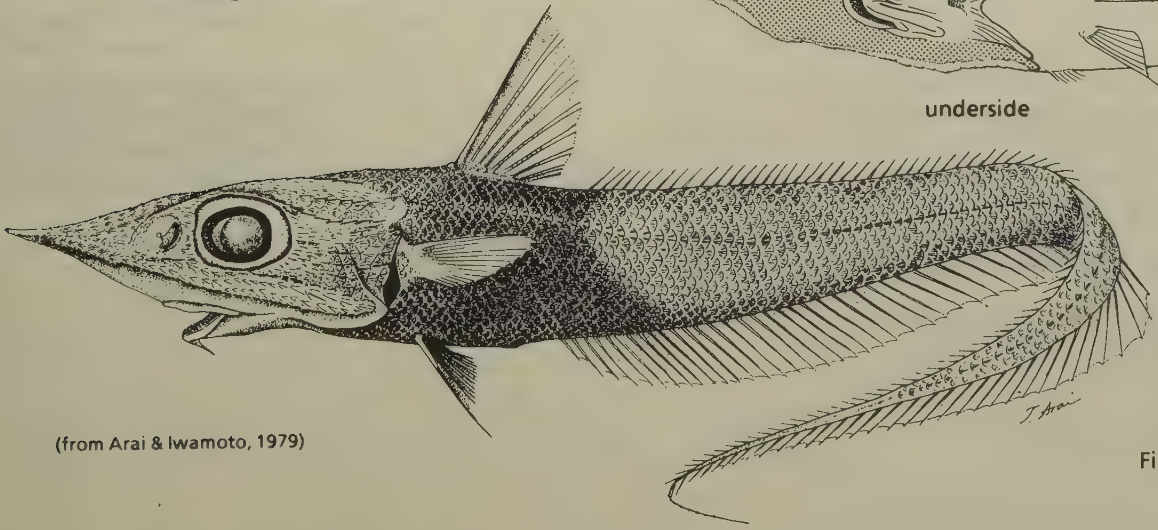
FAO Names : **En** - Campbell whiptail.


top of head


scale



underside



(from Arai & Iwamoto, 1979)

Fig. 380

Diagnostic Features : Snout long, sharply pointed, 43 to 48% of head length, much longer than orbit diameter; anterolateral margin sharp, but incompletely supported by bone; orbits 24 to 30% of head length; upper jaw 16 to 23% of head length; barbel 5.1 to 7.5% of head length; small teeth in bands in both jaws, upper jaw band short, not extending to end of rictus; lower jaw band tapered, extending to end of rictus; inner gill rakers on first arch 1 or 2 + 5 to 7; no supra-occipital scute, post-temporal ridge scarcely developed; underside of head generally naked, except for characteristic overlapping scales along leading edge of snout; dorsally, snout almost entirely scaled. First dorsal fin with 2 spines and 7 to 10 rays (usually 8 or 9), its height about equal to or usually less than postrostral length of head; pectoral fin rays i16 to i20. Light organ small, short; gland rounded, depressed, immediately anterior to periproct region, a dark streak extends forward to level of pelvic fin bases; anus slightly removed from anal fin origin. Scales large, fairly deciduous, spinules short, imbricate, aligned in 8 to 10 (in larger specimens), slightly divergent rows; scale rows below first dorsal fin base 4.5 to 5.5. Pyloric caeca 10 to 15, long and slender (about 0.8 to 0.9 times into orbit diameter). **Colour:** grey-brown overall, entire trunk completely encircled by bluish band; underside of head dusky to densely punctate; orbit rim black; fins blackish to dusky, membrane behind spinous second dorsal ray black; mouth and gill cavities black.

Geographical Distribution : New Zealand., Tasmania, Falkland/Malvinas Islands; Southeastern Atlantic off Gough and Discovery tablemounts (Fig. 381).

Habitat and Biology : Benthopelagic in 845 to 1 050 m (2.8 to 5.0°C) in the Pacific, and 340 to 1 360 m in the Atlantic. Feeds on deep-sea decapod crustaceans, gastropods, and polychaetes.

Size : To at least 43 cm total length.

Interest to Fisheries : None, although probably taken occasionally in bycatch of commercially important fishes.

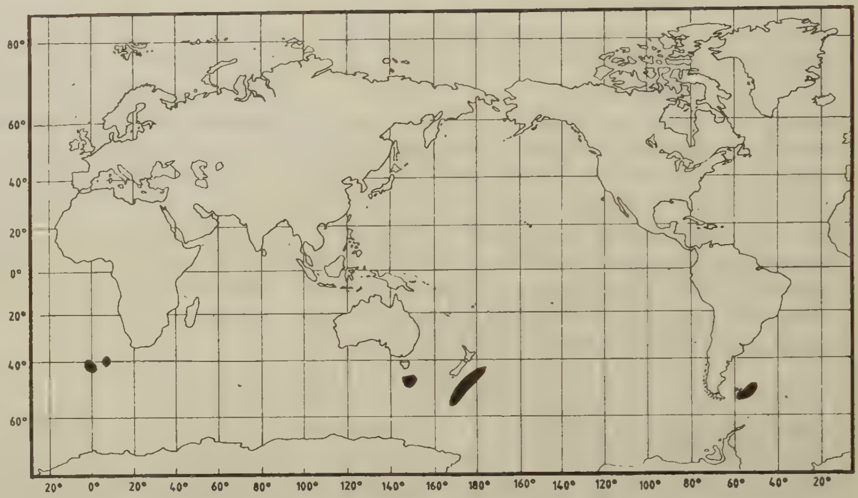


Fig. 381

Literature : Arai & Iwamoto (1979); McMillan & McKnight (1980); Trunov (1984).

Remarks : This species is easily recognized by the dark band encircling the trunk. It is currently known from widely separated localities in the southern hemisphere and will probably be found in intervening areas with more collecting.

Coelorinchus kamoharai Matsubara, 1943

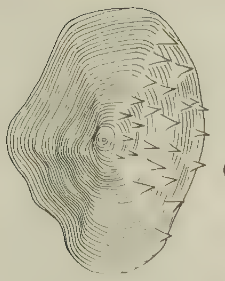
Fig. 382

MACROUR Coel 22

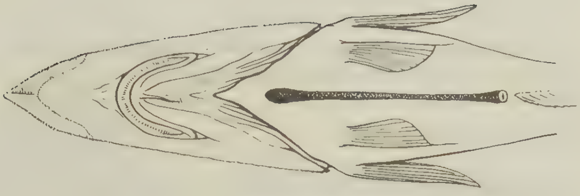
Scientific Name with Reference : ***Coelorhynchus kamoharai*** Matsubara, 1943, J. Sigenkagaku Kenkyusyo, 1(2):136, fig. 4 (Suruga Bay, Japan).

Synonyms : ***Coelorhynchus parallelus*** (non Günther, 1877) - Kamohara, 1938.

FAO Names : En - Kamohara grenadier.



scale
(from Okamura, 1970b)



underside
(from Okamura, 1970b)

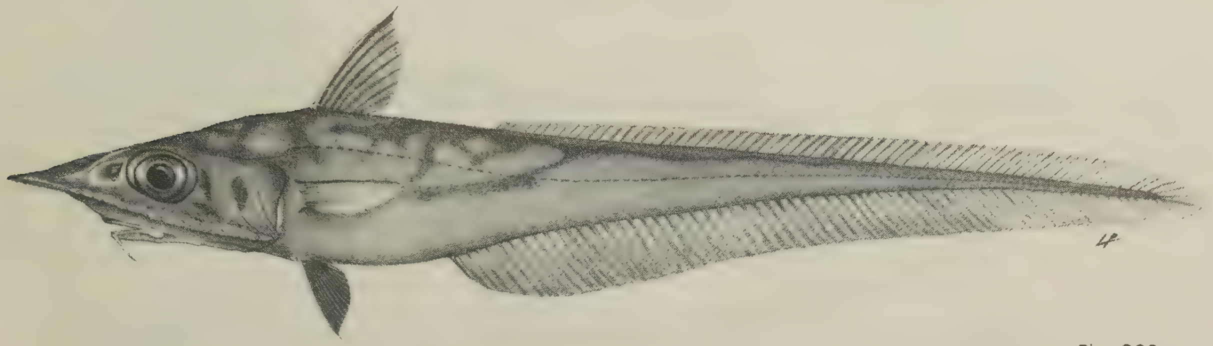


Fig. 382

Diagnostic Features : Snout long, sharply pointed, 31 to 37% of head length, anterolateral margin incompletely supported by bone; orbits 24 to 29% of head length, somewhat shorter than upper jaw (28 to 34% of head length); teeth cardiform, in long tapered bands in premaxillae, in a narrow band in mandible, teeth bands of both jaws extend to end of rictus; inner gill rakers on first arch 1 or 2 + 8 to 10; head ridges not strongly developed; characteristic broad scales on underside behind leading edge of snout; underside of head and mandibular rami otherwise naked, but densely covered with unpaired black papillae. First dorsal fin with 2 spines and 8 to 10 rays, its greatest height less than postrostral length of head; pectoral fin rays i15 to i19. Black streak of light organ long, extending from anus to near isthmus, anteriorly expanded but scale covered. Scales thin, deciduous; spinules on body scales short, broad-based, widely spaced, arranged in quincunx order; scale rows below midbase of first dorsal fin about 3.5 to 4. Pyloric caeca 7 to 13. **Colour**: light brown, irregularly blotched or mottled on dorsum above midlateral line, silvery over abdominal region; median nasal process black; gular and branchiostegal membranes heavily punctate; mouth and gill cavities whitish; fins dusky or punctate, first dorsal fin blackish.

Geographical Distribution : Southern Japan, south to Taiwan Island (Fig. 383).

Habitat and Biology : Benthopelagic in about 220 to 400 m depth.

Size : To at least 28 cm total length.

Interest to Fisheries : Taken by trawlers, but no separate catch statistcs recorded.

Local Names : JAPAN: Ichimonji-hige.

Literature : Okamura (1970a); Yatou in Okamura & Kitajima, 1984.

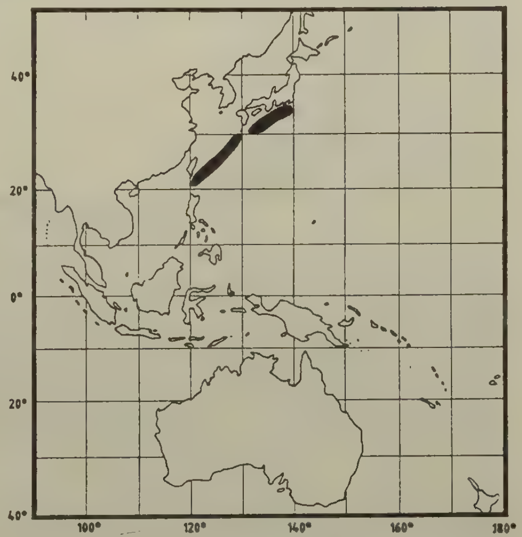


Fig. 383

Coelorinchus karrerae Trunov, 1984

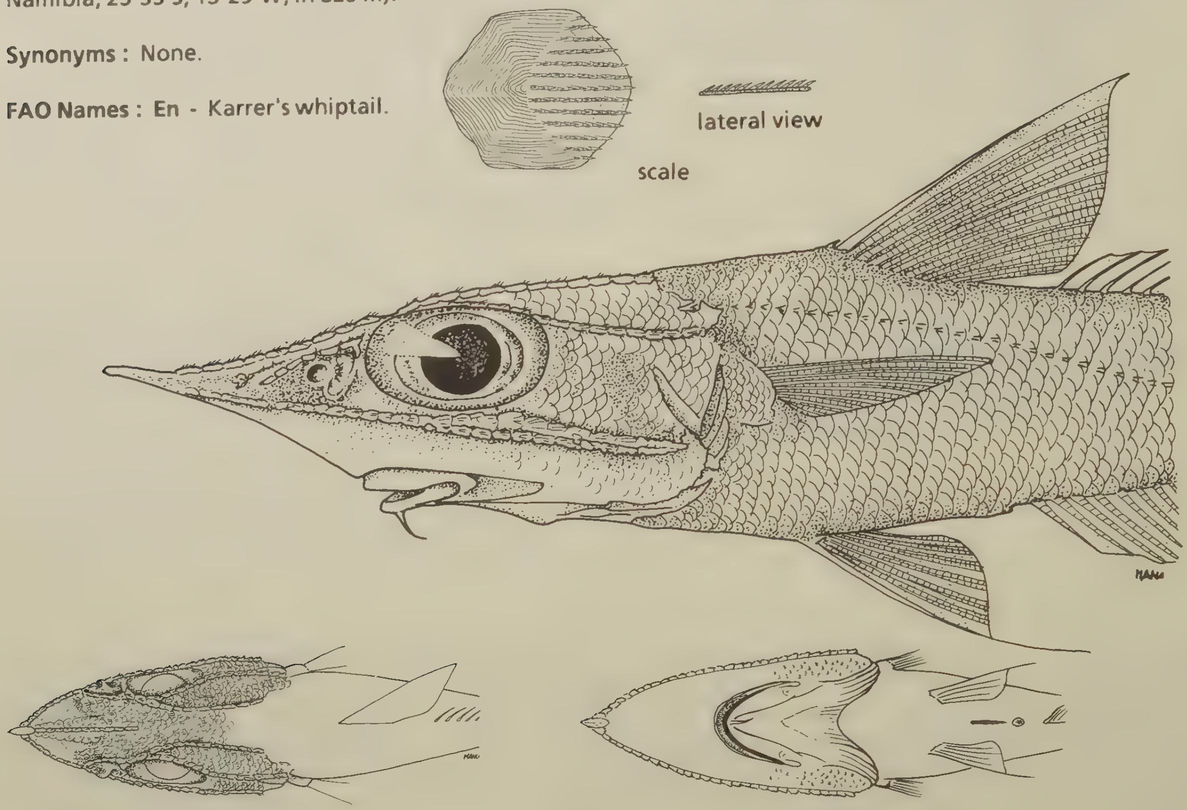
Fig. 384

MACROUR Coel 23

Scientific Name with Reference : *Coelorinchus karrerae* Trunov, 1984 , Voprosy Iktiologii t. 24, vol. 3: 359, fig. 3 (off Namibia, 25°35'S, 13°29'W, in 825 m).

Synonyms : None.

FAO Names : En - Karrer's whiptail.



(after Trunov, 1984)

Fig. 384

Diagnostic Features : Snout long (41 to 46% of head length), attenuated, sharply pointed, its anterolateral margin completely supported by bone; orbits 27 to 31% of head length, outline somewhat squared off at anterior end; posterior nostril large 8 to 12% of head length; mouth small, inferior, opening restricted at posterior angle; teeth in broad bands in both jaws; premaxillary band short, ending short of angle of mouth; mandibular band longer, tapered; inner gill rakers on first arch 7-9 total; head ridges narrow, sharply spined, underside of head mostly naked except posteriorly behind level of mouth angle, where there are patches of thin, deciduous scales; nasal fossa naked; dorsally behind anterolateral margins of snout naked or with thin, deciduous scales First dorsal fin with 2 spines and 8 to 10 rays, its height less than postrostral length of head; pectoral fin rays i17 to i19. Light organ small, externally apparent as a blackish streak extending forward of anus to between pelvic fins; anus removed from anal fin by 2 or 3 scale rows. Body scales rather deciduous, covered with as many as 16 parallel rows of small, conical spinules; scale rows below midbase of first dorsal fin 5 1/2 to 7 1/2. Swimbladder large, oval, with 4 retia mirabilia. Pyloric caeca 7 to 10. **Colour:** light brown to swarthy; abdominal region bluish; fins dusky to blackish; mouth and gill cavities blackish.

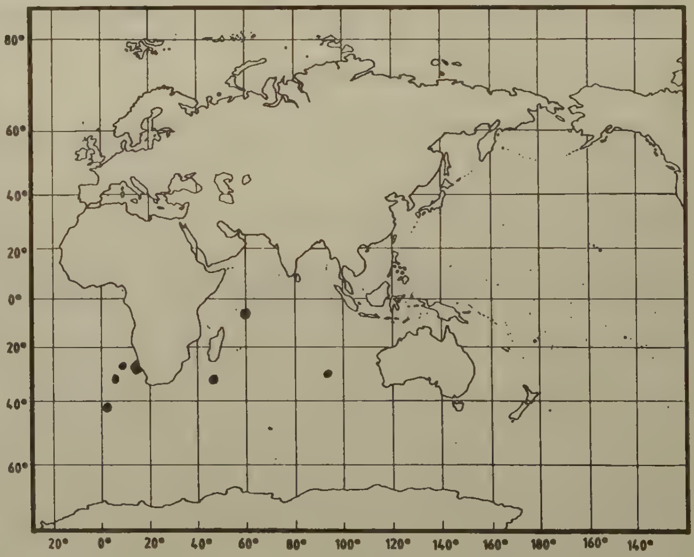


Fig. 385

Geographical Distribution : Southeast Atlantic off Valdivia Bank, Discovery Tablemount, Namibia; Indian Ocean off Madagascar Ridge, Saya de Malha Bank, Broken (West Australian) Ridge (Fig. 385).

Habitat and Biology : Benthopelagic in 500 to 1 150 m.

Size : To at least 35 cm total length.

Interest to Fisheries : A small species, but common where found; not now utilized by commercial fisheries.

Literature : Trunov (1984).

Remarks : ***Coelorinchus karrerae*** is very close to ***C. innotabilis*** from Australia and New Zealand, but differs primarily in having a more slender snout. Viewed from above, the sides of the snout are gently convex, whereas in ***C. innotabilis*** the sides are more convex.

Coelorinchus kishinouyei Jordan & Snyder, 1900

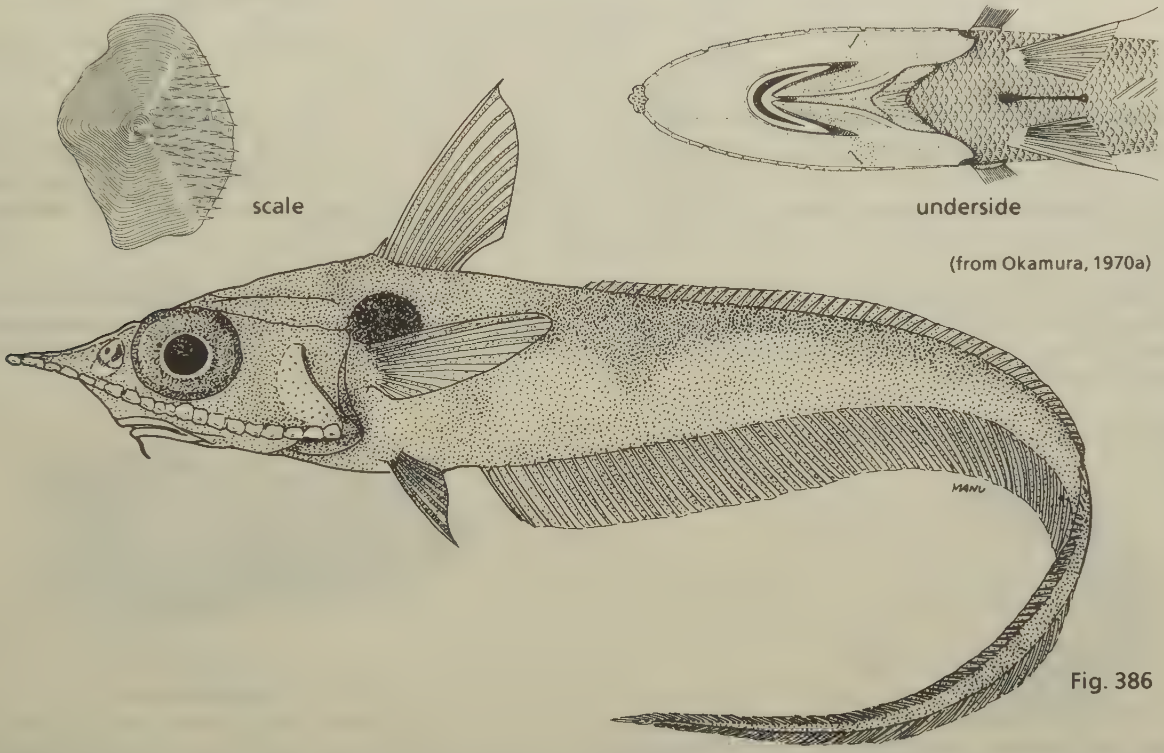
Fig. 386

MACROUR Coel 24

Scientific Name with Reference : ***Coelorhynchus kishinouyei*** Jordan & Snyder, 1900, Proc.U.S.Natl. Mus., 23:376, pl. 20 (Misaki, Japan).

Synonyms : None.

FAO Names : **En** - Mugura grenadier.



(from Okamura, 1970a)

Fig. 386

Diagnostic Features : Snout 33 to 45% of head length, its anterolateral margin convex and completely supported by bone; broad triangular naked areas on dorsal surface; the terminal scute small, blunt, trifid, poorly defined in larger individuals; orbit diameter 31 to 38% of head length; upper jaw 23 to 29% of head length; premaxillary teeth in broad, short bands extending 2/3 of length of rictus; mandibular teeth in a broad tapered band extending to end of rictus; inner gill rakers on first arch 0 to 2 + 7 or 8; space between nasal fossa and suborbital ridge naked; underside of head (except for a few small scales below infraorbital-preopercle ridge junction) naked; head ridges relatively strong. First dorsal fin with 2 spines and 8 to 10 rays, its height about equal to postrostral length of head; pectoral fin rays i15 to i19. The blackish streak of the light organ extends forward of vent to between pelvic fin bases, expanded into a naked fossa anteriorly; anus removed from anal fin by 2 or 3 scale rows. Body scales rather large, covered with 8 to 17 parallel to slightly divergent rows of short, slender spinules; scale rows below midbase of first dorsal fin 3.5 to 4.5. Pyloric caeca 19 to 26. **Colour:** light brown overall; a large ocellated black blotch above and behind pectoral fin bases; a fainter saddle below anterior end of second dorsal fin extending 2 or 3 rows below lateral line; underside of head with scattered, often dense punctuations; mouth cavity whitish; gill cavity blackish; fins generally dusky, but pelvics blackish.

Geographical Distribution : Southern Japan (Fig. 387).

Habitat and Biology : Benthopelagic in 250 to 450 m (8 to 12°C). Feeds primarily on polychaetes, with crustaceans of minor importance. Spawns apparently between February and April.

Size : To 36 cm.

Interest to Fisheries : Taken by trawlers, but no separate statistics are maintained.

Local Names : JAPAN: Mugura-hige.

Literature : Okamura (1970a).

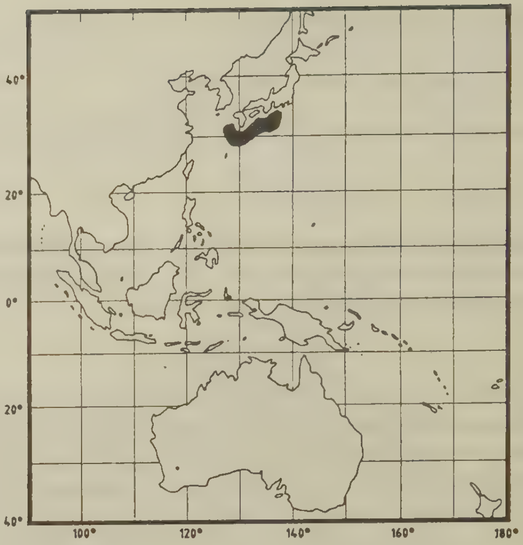


Fig. 387

Coelorinchus labiatus (Koehler, 1896)

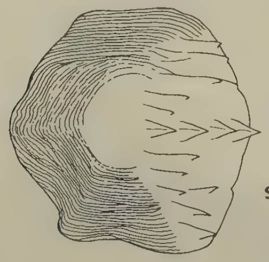
Fig. 388

MACROUR Coel 25

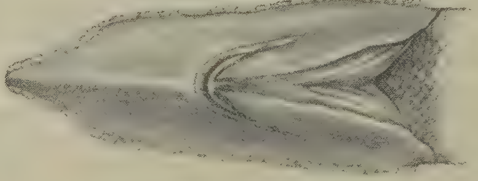
Scientific Name with Reference : ***Macrurus labiatus*** Koehler, 1896, Ann. Univ. Lyon, 26: 497, pl. 27, figs. 7, 8 (Bay of Biscay, 570-700 m).

Synonyms : ***Macrurus japonicus*** -- Vaillant, 1888 [non Temminck & Schlegel); ***Coryphaenoides (Coelorhynchus) talismani*** Collett, 1905; ***Macrurus (Coelorhynchus) talismani*** -- Murray & Hjort, 1912; ***Coelorhynchus talismani*** -- Gilbert & Hubbs, 1916; ***Coelorhynchus vaillanti*** -- Roule, 1919; ***Oxygadus labiatus*** -- Grey, 1956; ***Coelorhynchus labiatus*** -- Tortonese, 1970.

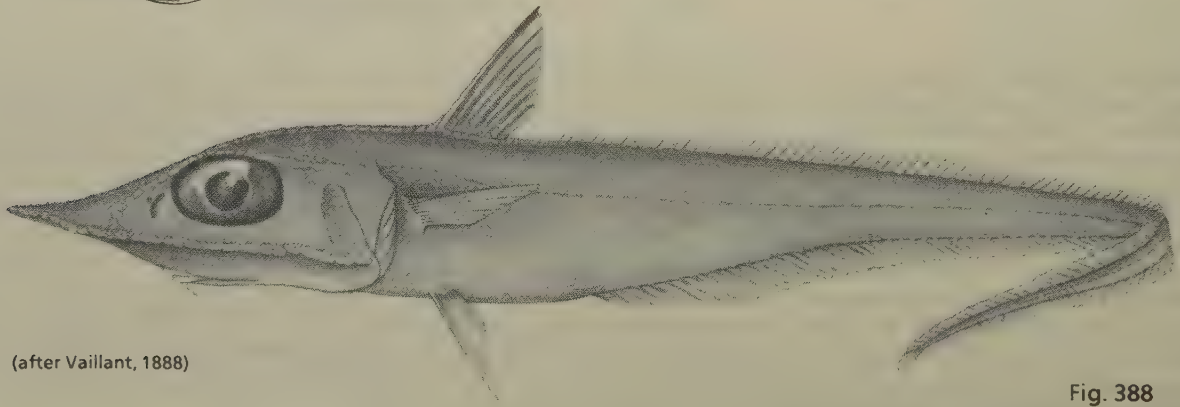
FAO Names : En - Spearsnouted grenadier.



scale



underside
(after Vaillant, 1888)



(after Vaillant, 1888)

Fig. 388

Diagnostic Features : Snout long, sharply pointed, 45 to 49% of head length, its anterolateral margin almost completely supported by bone (a narrow gap between median and lateral processes of nasal bone); terminal snout scute elongated, pointed; orbit diameter 26 to 28% of head length, equal to or usually greater than postorbital length (postorbital 1.0 to 1.1 times into orbit diameter), orbit diameter 1.6 to 1.88 times into snout; subopercle projecting as a narrow flap; mouth small, upper jaw length much less than orbit diameter; barbel about 4 times into orbit diameter; teeth in upper jaw in a broad short band that falls well short of end of rictus; lower jaw teeth in a long, moderately broad band that extends beyond angle of mouth; inner gill rakers on first and second arches 7 to 9 total; underside of head entirely naked; dorsal surfaces of head with broad areas behind anterolateral snout margins either naked or with small, thin scales; shelf below orbits also similarly naked or sparsely scaled; head ridges strong and coarsely spined. First dorsal fin with 2 spinous and 7 to 9 segmented rays, the fin much shorter than the postrostral length of head; pectoral fin rays i16 to i19. Light organ short, not externally visible; anus at anal fin. Body scales with a prominent median keel composed of overlapping triangular spinules, the largest set at an angle of about 45 degrees; 3 to 7 smaller, shorter, parallel rows on either side. **Colour:** overall greyish, underside of head pale; a prominent black ring around eye; mouth and gill cavities blackish; first dorsal fin uniformly dusky.

Geographical Distribution : Eastern North Atlantic (Fig. 389).

Habitat and Biology : Benthopelagic in 460-2220 m depth. Feeds primarily on small fish and bottom-living crustaceans.

Size : To more than 50 cm total length.

Interest to Fisheries : Currently of no commercial importance, as far as known.

Literature : Vaillant (1888); Koehler (1896); Farran (1924); Koefoed (1927); Marshall & Iwamoto (in Marshall 1973).

Remarks : Marshall & Iwamoto (in Marshall, 1973) erroneously synonymized the species with *C. occa*, but the two are quite distinct, as indicated in the key and in the description of *C. occa*.

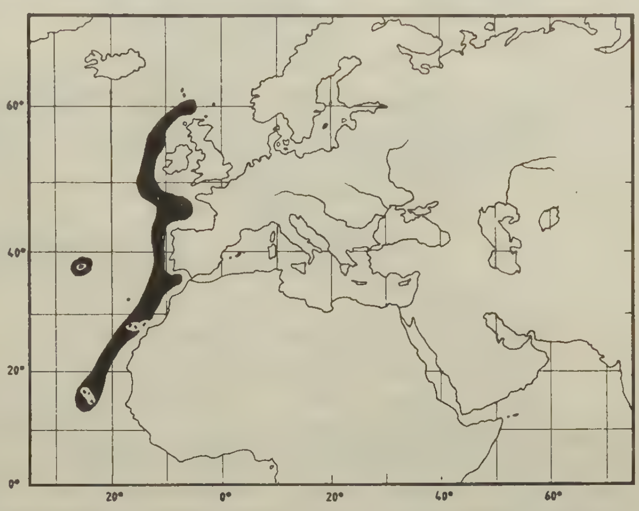


Fig. 389

Coelorinchus longicephalus Okamura, 1982

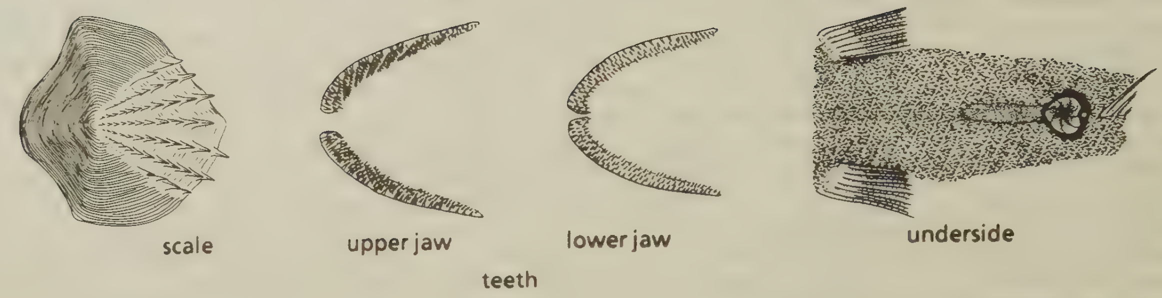
Fig. 390

MACROUR Coel 26

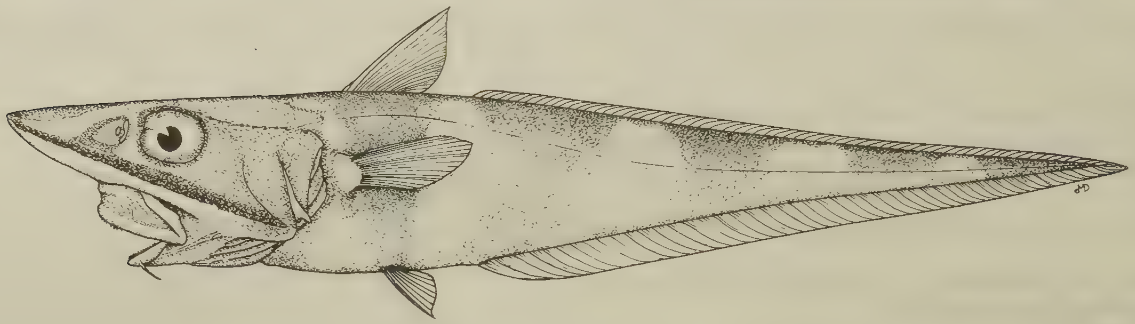
Scientific Name with Reference : *Coelorinchus longicephalus* Okamura, 1982, Fishes of the Kyushu-Palau Ridge and Tosa Bay,, p. 176 (Kyushu-Palau Ridge, 27°54.2'N, 134°39.5'E, 700 m).

Synonyms : None

FAO Names : **En** - Longhead grenadier.



(from Okamura in Okamura et al., 1982)



(after Okamura, in Okamura et al. (1982)

Fig. 390

Diagnostic Features : Head large, 3.4 to 3.7 times in total length; snout long (43 to 45% of head length), and tipped with a blunt tricuspid tubercle, its anterolateral margin incompletely supported by bone; orbit diameter 20 to 22% of head length; interorbital space 18 to 22% of head length, about equal to orbit diameter; mouth large, upper jaw 28 to 31% of head length, maxillary bone extends to below posterior end of orbit; barbel short, about 2/5 to 1/2 of orbit diameter; subopercle ends in a narrow protruding tip; teeth in long, rather broad bands in both jaws; inner gill rakers on first arch 2 + 6 to 8; head ridges well developed; underside of head naked except for a small patch below preopercular angle. First dorsal fin with 2 spines and 9 rays, its height much less than postrostral length of head; pectoral fin rays i17 to i18. Light organ small, externally apparent as a narrow blackish streak extending forward of anus to about midway between pelvic fin insertions and anal fin origin. Body scales with 5 to 7 divergent rows of stout, broad spinules, the lateral rows somewhat lower than median one; scale rows below midbase of first dorsal fin 5 to 5.5. Pyloric caeca 48 to 60. **Colour:** brown but bluish over trunk; 5 or 6 broad saddle marks on body extending below lateral line (indistinct in large specimens); fins blackish except for whitish base and tip of first dorsal; and mouth bluish grey, gill cavities black.

Geographical Distribution : Kyushu-Palau Ridge (Fig. 391).

Habitat and Biology : Benthopelagic in 336 to 700 m.

Size : To at least 89 cm total length.

Interest to Fisheries : The large size attained by this species suggests that there may be some potential for commercial exploitation.

Local Names : JAPAN: Zunaga-sokodara.

Literature : Okamura, Amaoka & Mitani, eds (1982).

Remarks : The description and illustrations are from Okamura's (1982) original description. See the description for ***C. hexfasciatus*** for a comparison with related species.

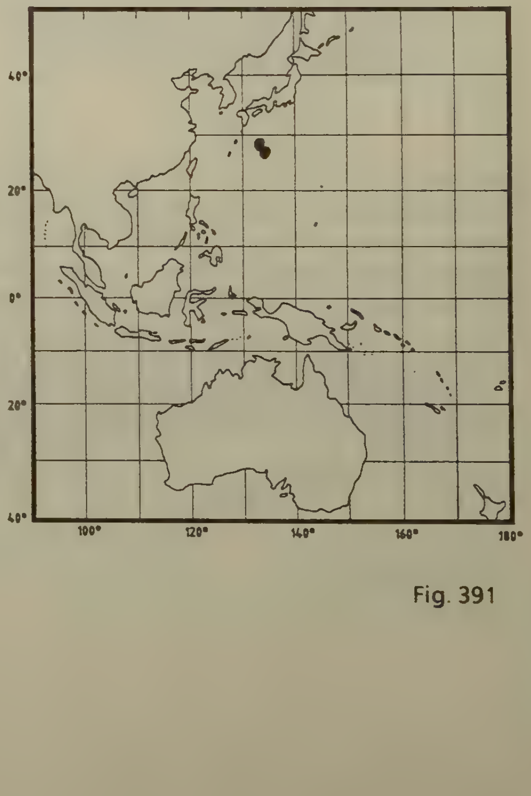


Fig. 391

Coelorinchus macrochir (Günther, 1877)

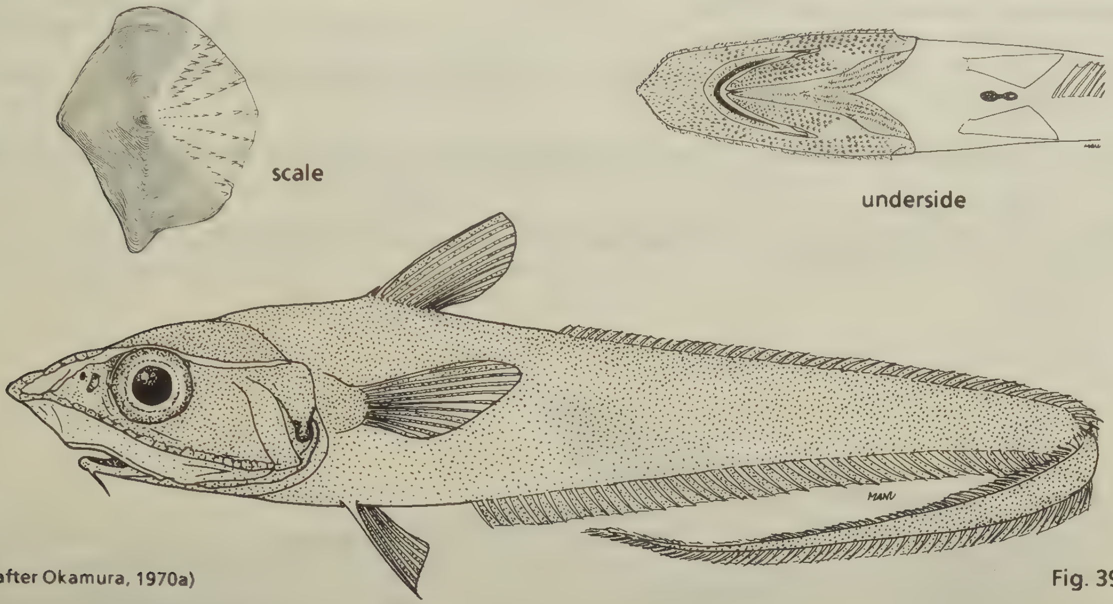
Fig. 392

MACROUR Coel 27

Scientific Name with Reference : ***Macrurus macrochir*** Günther, 1877, Ann.Mag.Nat.Hist., ser. 4, 20:438 (Enoshima, Kagoshima Prefecture, Japan, in 631 m).

Synonyms : ***Macrurus (Malacocephalus) macrochir*** - Günther, 1887; ***Abyssicola macrochir*** - Goode & Bean, 1896; ***Coelorhynchus (Abyssicola) macrochir*** - Gilbert & Hubbs, 1916.

FAO Names : En - Longarm grenadier.


scale

underside

(after Okamura, 1970a)

Fig. 392

Diagnostic Features : Snout tipped with a blunt tubercular scute, its length about 2.8 to 3.4 times into head length; mouth moderate in size; upper jaw 34 to 42% of head length, extending to below posterior end of orbit; orbits large, their diameter 3 to 3.7 times into head length; interorbital space 0.8 to 1.1 times into orbit diameter; barbel 3.1 to 5.6 times into orbit diameter; premaxillary teeth in about three series, the outermost slightly enlarged; mandibular teeth biserial, the inner series enlarged; inner gill rakers on first arch 1 or 2 + 9 or 10; underside of head completely scaled except for gill and gular membranes; head ridges well developed. First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays i16 to i20. Anus about midway between pelvic and anal fins; a naked fossa of light organ immediately anterior to, but separated from periproct region. Scales covered with short, rather broad spinules arranged in 4 to 9 widely divergent rows; scales below midbase of first dorsal fin 4.5 to 6. **Colour:** overall brownish, bluish ventrally over abdomen; mouth and gill cavities blackish, but latter with whitish hyoid area and along posterior margin; fins dusky or blackish.

Geographical Distribution : Japan and East China Sea (off Kagoshima Prefecture) (Fig. 393).

Habitat and Biology : Benthopelagic, in 235 to 830 m (5 to 10°C). Feeds chiefly on euphausiids, prawns, and small fishes (e.g., myctophids). Spawning occurs from winter to spring (Okamura, 1970a).

Size : To 68 cm total length.

Interest to Fisheries : The relatively large size attained and the fairly common occurrence of this species makes it of potential interest to commercial fisheries off Japan and the East China Sea.

Local Names : JAPAN: Tenaga-dara.

Literature : Okamura (1970a); Okamura (in Okamura & Kitajima, 1984).

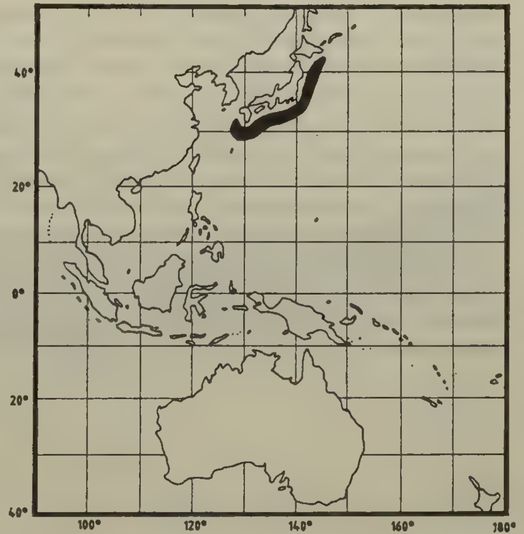


Fig. 393

Remarks : Osamu Okamura, who has studied this species and other members of the genus ***Coelorinchus*** in considerable detail, has informed the author (January 1986) that the genus ***Abyssicola*** should be treated as a synonym of ***Coelorinchus***.

Coelorinchus marinii Hubbs, 1934

Fig. 394

MACROUR Coel 3

Scientific Name with Reference : ***Coelorhynchus marinii*** Hubbs, 1934, Occas. Pap. Mus. Zool. Univ. Michigan **(298)**: 1-9, pl. 1 (off Buenos Aires, 38°52'S, 56°20'W).

Synonyms : ***Coryphaenoides barattinii*** Fowler, 1943; ***Coelorhynchus coelorhynchus marinii*** -- Marshall & Iwamoto, 1973.

FAO Names : En - Marini's grenadier; **Fr** - Grenadier de Marini; **Sp** - Granadero de Marini.

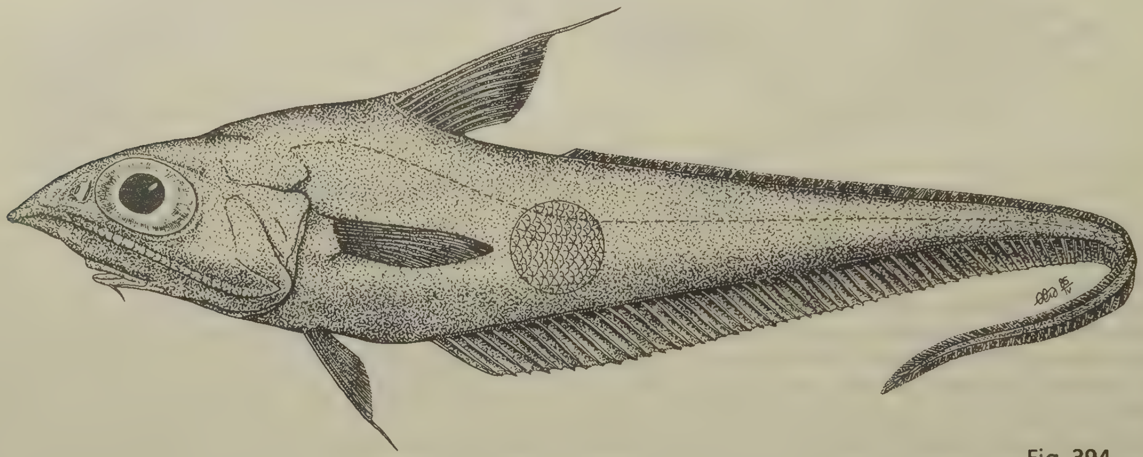


Fig. 394

Diagnostic Features : Head low, slightly deeper than broad; subopercle margin rounded, without a posteroventral projection; snout moderately pointed, 31 to 34% of head length; terminal snout scute of moderate size, not especially set off by its size or spines from adjacent scales of suborbital ridge; anterolateral margin of snout not supported by bone; orbit diameter 34 to 39% of head length; upper jaw 28 to 34% of head length; inner gill rakers on first arch 13 or 14 total; outer rakers on second arch 10 to 12 total; underside of snout with a median naked area, but most of snout and suborbital space otherwise scaled; head ridges moderately strengthened with coarse scales. First dorsal fin with 2 spines and 9 or 10 segmented rays, its height about equal to postrostral length of head; second dorsal fin rudimentary over most of its length; interspace between dorsals equal to about 1/3 length of head; outer pelvic ray slightly elongated. Scale rows below second dorsal fin origin about 6 to 6.5; most body scales covered with small fine, reclined spinules arranged in an irregular quincunx to subparallel pattern. Black naked fossa of light organ between and slightly anterior to pelvic fin bases. **Colour:** overall medium brown to swarthy, darker over abdomen and chest; underside of head peppered with small melanophores; pectoral fins dusky, their inner bases black; pelvic fins black except for whitish outermost ray; anal fin blackish, paler at base; mouth, lips and barbel pale.

Geographical Distribution : Southwestern Atlantic, from southern Brazil (about 29°S) to Antarctic (South Georgia) (Fig. 395).

Habitat and Biology : Benthopelagic in about 200 to 600 m depth.

Size : To at least 38 cm total length.

Interest to Fisheries : A bycatch of hake trawlers on the Patagonian slope.

Local Names : USSR : Dolgokhvost marini.

Literature : Marshall & Iwamoto (in Marshall, 1973); Iwamoto & Geistdoerfer (1985).

Remarks : Considered by Marshall & Iwamoto (1973) as a subspecies of ***Coelorinchus coelorhincus***, but ***C. marinii*** can be distinguished by the more numerous gill rakers, longer outer pelvic fin ray (more than half head length), deeper body (56 to 80% of head length), and absence of distinctive body or fin markings.

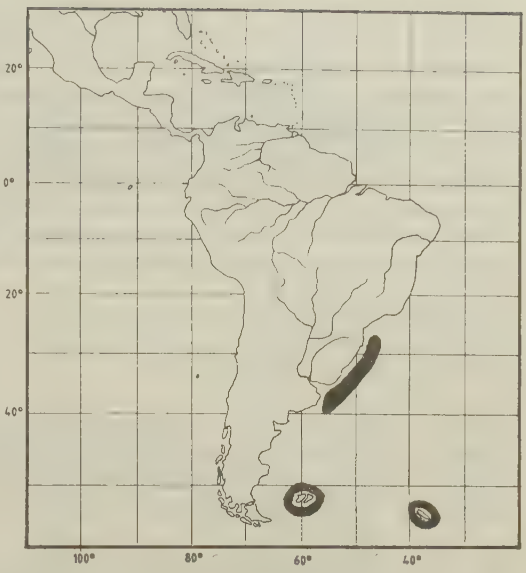


Fig. 395

Coelorinchus matamua (McCann & McKnight, 1980)

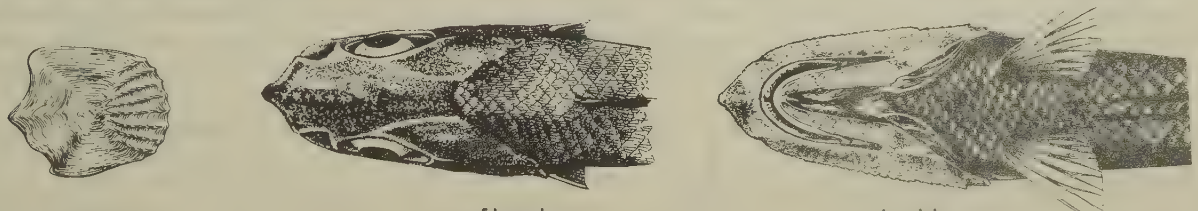
Fig. 396

MACROUR Coel 28

Scientific Name with Reference : ***Mahia matamua*** McCann & McKnight, 1980, New Zeal.Oceanogr.Inst.Mem., 61:53 (New Zealand; 38°42.0'S, 178°33.3'E, 828 to 839 m).

Synonyms : None

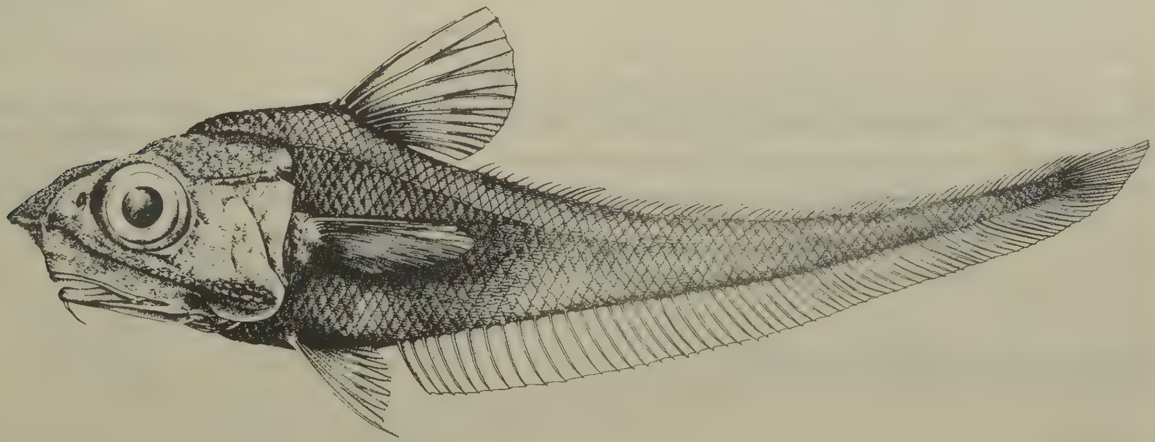
FAO Names : En - Mahia whiptail.



scale

top of head

underside



(from Iwamoto, in Smith & Heemstra, 1986)

Fig. 396

Diagnostic Features : Snout bluntly pointed, high, narrow, its anterolateral margin incompletely supported by bone; orbits large, their diameter about 34% of head length or more, about equal to snout length; mouth rather large, unrestricted laterally; upper jaw about 35 to 40% of head length; small teeth in long, tapered bands in both jaws; head ridges with modified thickened scales but not especially spiny; suborbital ridge well defined; underside of head entirely scaled except lips and gill membranes. First dorsal fin with 2 spines and 9 rays, its height about half of head length; pectoral fin rays i16 to i17; inner gill rakers on first arch 2 + 10. Light organ a small globular gland adjacent to anus, not externally visible; anus immediately anterior to anal fin origin or removed from same by 1 or 2 scale rows. Scales large, thin; imbricate spinules in low, slightly divergent ridgelike rows (as many as 11 rows in body scales of large individuals); scales below midbase of first dorsal fin about 4.5 to 5.5. **Colour:** grey to greyish pink; a conspicuous dark blue band around abdominal area; fins and gill membranes blackish.

Geographical Distribution : New Zealand, southeastern Australia, Tasmania, southern Africa (Fig. 397).

Habitat and Biology : Benthopelagic in 450 to 1 000 m depth. Apparently feeds on fishes (myctophids) and crabs, among other items.

Size : To at least 65 cm total length.

Interest to Fisheries : Frequently taken as bycatch by trawlers in 450 to 1 000 m off Tasmania (Last et al., 1983); very abundant off continental slope of southern Africa.

Local Names : AUSTRALIA: Blue-banded whiptail, Mahia rattail.

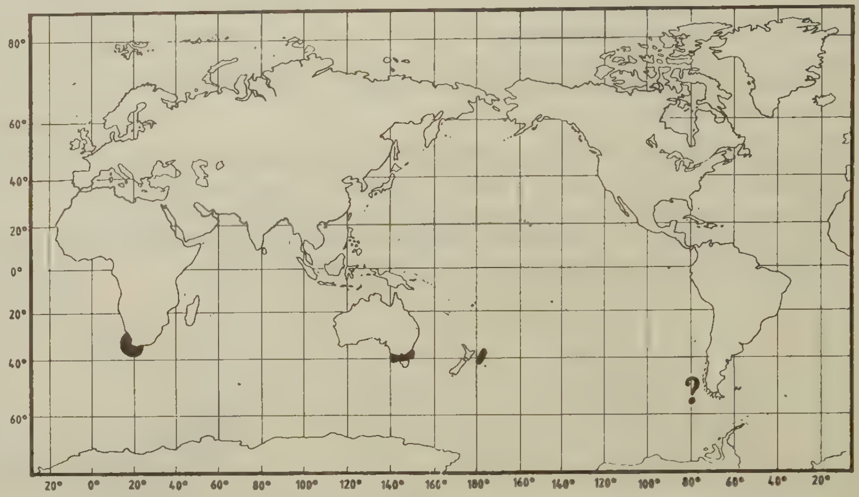


Fig. 397

Literature : McCann & McKnight (1980); Last et al. (1983).

Remarks : Large catches of *C. fasciatus* reported off southern Africa by Gilchrist (1921, 1922) and Gilchrist & von Bonde (1924), may, in fact, have been of *C. matamua*. If true, the species is of considerable importance as a primary prey item for the commercially valuable "stockfish" (*Merluccius capensis*) of that area. Nakamura (1986) reported the species from southern Chile, but the specimen figured is not *C. matamua* and his description does not agree with that species. The presence of *C. matamua* in Chile must therefore be considered as doubtful.

Coelorinchus multispinulosus Katayama, 1942

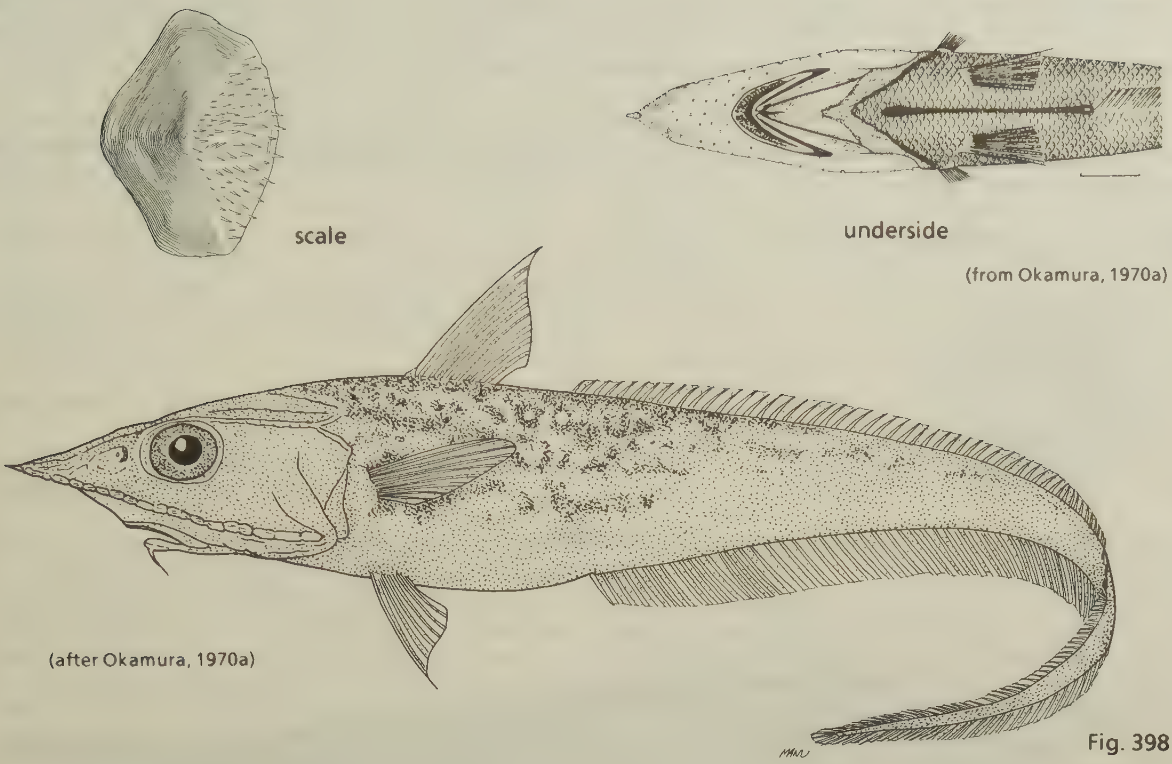
Fig. 398

MACROUR Coel 29

Scientific Name with Reference : *Coelorhynchus multispinulosus* Katayama, 1942, Zool.Mag., 54(8):332, fig. 1 (San-in District, Japan).

Synonyms : *Coelorhynchus vermicularis* Matsubara, 1943; *Coelorhynchus japonicus* - Mori, 1952 (non Temminck & Schlegel, 1842).

FAO Names : En - Spearnose grenadier.


scale

underside

(from Okamura, 1970a)

(after Okamura, 1970a)

Fig. 398

Diagnostic Features : Snout long, 40 to 45% of head length, tipped with an acutely pointed scute, its anterolateral margin incompletely supported by bone; orbits moderate-sized; their diameter 22 to 27% of head length; upper jaw 27 to 31% of head length; small teeth in bands in both jaws, those in lower jaw may be in only 2 or 3 irregular series; inner gill rakers on first arch 1 or 2 + 6 to 8; head ridges not excessively spiny or coarsely developed; broad naked areas above snout; underside of head naked except for characteristic crescent-shaped patch below anterolateral margin of snout. First dorsal fin with 2 spines and 8 to 10 rays, second spinous ray less than postrostral length of head; pectoral fin rays i13 to i17. Blackish streak of light organ long, extending from anus to near isthmus. Scales thin, relatively adherent, body scales with small, slender, weak spinules (15 to 73) in quincunx order; scales below midbase of first dorsal fin 3.5 to 4.5. Pyloric caeca 11 to 20. **Colour:** greyish-brown overall, with prominent greyish vermiculations and blotches dorsally on body and nape; gular, thoracic, and perianal regions densely covered with blackish pigments; mouth whitish; gill cavity blackish, fins dusky; membrane behind second spine blackish.

Geographical Distribution : Southern Japan to East China Sea (Fig. 399).

Habitat and Biology : Benthopelagic in 150 to 300 m depth over sandy mud bottoms.

Size : To 38 cm total length.

Interest to Fisheries : An abundant species taken by trawlers, but no separate statistics maintained.

Local Names : JAPAN: Yari-hige.

Literature : Okamura (1970a); Yatou (in Okamura & Kitajima, 1984).

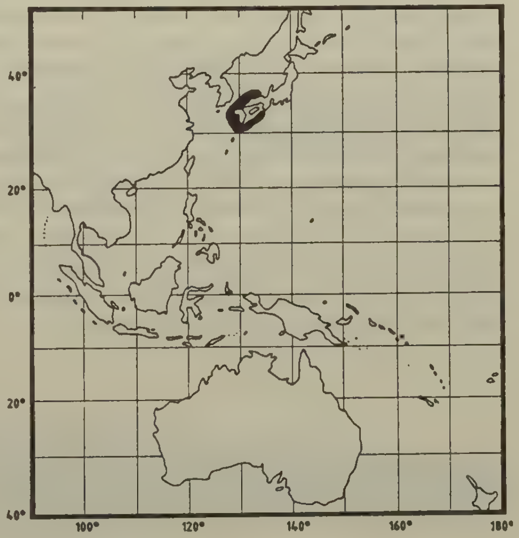


Fig. 399

Coelorinchus occa (Goode & Bean, 1885)

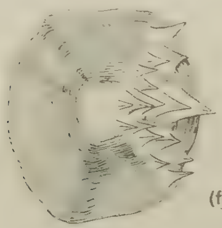
Fig. 400

MACROUR Coel 30

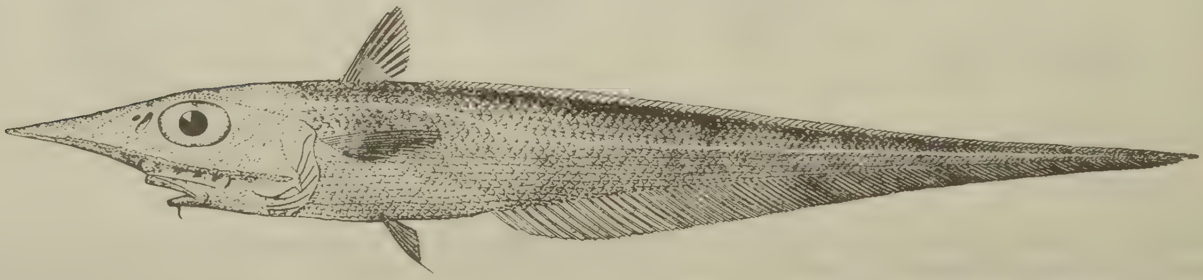
Scientific Name with Reference : ***Macrurus occa*** Goode & Bean, 1885, Proc. U.S. Natl. Mus., 8: 595 (n. Gulf of Mexico; 28°34'N, 86°48'W; 613 m).

Synonyms : ***Coelorhynchus occa*** -- Goode & Bean, 1896; ***Coelorhynchus (Oxygadus) occa*** -- Gilbert & Hubbs, 1920; ***Oxygadus occa*** -- Parr, 1946.

FAO Names : En - Swordsnout grenadier.



scale
(from Parr, 1946)



(from Goode & Bean, 1896)

Fig. 400

Diagnostic Features : Snout long, sharply pointed, 44 to 47% of head length, its anterolateral margin almost completely supported by bone (a narrow gap between median and lateral processes of nasal bone); orbit diameter 23 to 27% of head length, usually less than postorbital length, 1.74 to 2.10 times into snout length; subopercle projecting as a narrow flap; inner gill rakers on first and second arches 7 to 9 total; teeth in upper jaw in a broad, short band that does not extend the entire length of rictus; lower jaw teeth in a long, moderately tapered band extending beyond angle of mouth; head ridges strong and coarsely spined; terminal snout scute elongated, pointed, without lateral protuberances; dorsal surfaces of head completely scaled except for nasal fossa, scales atop head with spinules set in divergent rows; underside of head naked except for small isolated scales above angle of mouth and below end of preopercle ridge of occasional individuals. First dorsal fin with 2 spinous and 7 to 9 segmented rays, the fin height much shorter than postrostral length of head; pectoral fin rays i16 to i19. Body scales coarse, rough, with a prominent median keel composed of several stout triangular spinules, the largest set at 60 to 70 degrees from the horizontal; 2 to 4 much lower, subparallel to divergent rows on either side of median keel, these lateral rows often short, with some not extending to edge of scale. Light organ short, not externally visible; anus immediately before anal fin. **Colour**: swarthy to brownish, ventrally darker on abdomen, no prominent markings; mouth and gill cavities blackish; first dorsal fin uniformly dusky.

Geographical Distribution : Central North Atlantic from Florida Straits to northeastern South America; one record from Bermuda; recorded also from southeastern Atlantic (Fig. 401).

Habitat and Biology : Benthopelagic in about 400 to 2 200 m depth . Feeds primarily on small fish and bottom-living crustaceans.

Size : To more than 50 cm total length.

Interest to Fisheries : Taken in fairly large numbers in 600 to 1000 m in some areas, but of no current commercial importance.

Local Names : JAPAN: Nishi-toujin

Literature : Parr (1946); Marshall & Iwamoto (in Marshall 1973) (in part); ?Trunov (1984).

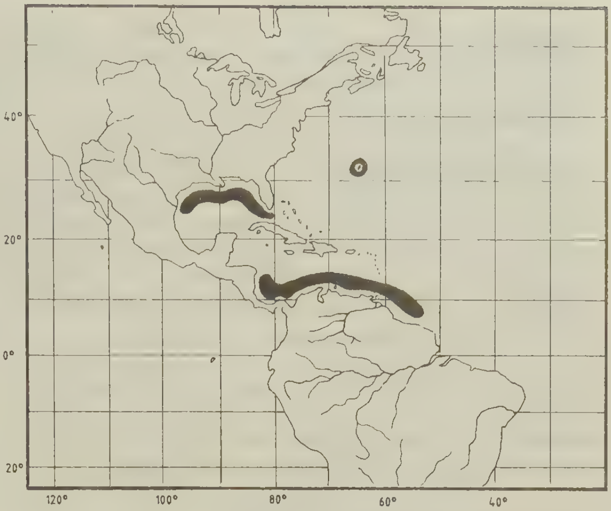


Fig. 401

Remarks : Marshall & Iwamoto (in Marshall, 1973) synonymized ***C. labiatus*** with this species, but suggested that it may be necessary to recognize eastern and western subspecies when additional material are compared from the two sides of the Atlantic. Examination of fresh material from the northeastern Atlantic taken by the FFS WALTHER HERWIG leaves no doubt as to the specific distinctness of the two populations. The squamation of ***C. occa*** is much coarser than that in ***C. labiatus***, the individual spinules on body scales are set at a higher angle (60 to 70 degrees from horizontal compared with about 45 degrees), and there are fewer rows lateral to the enlarged median row (2 to 4 in ***C. occa*** vs. 3 to 7 in adults of ***C. labiatus***). Furthermore, broad areas dorsolaterally on the snout and below the orbit are naked or sparsely scaled with thin, weak, nonspinulated scales in ***C. labiatus***, whereas in ***C. occa*** these same areas are densely covered with small scales having erect spinules. A most notable character in fresh specimens is the prominent black eye ring in ***C. labiatus*** that is lacking in ***C. occa***.

The distribution of ***C. occa*** south of northeastern South America is uncertain. Trunov's (1984) identification of specimens taken off southern Africa must be confirmed.

Coelorinchus oliverianus Phillipps, 1927

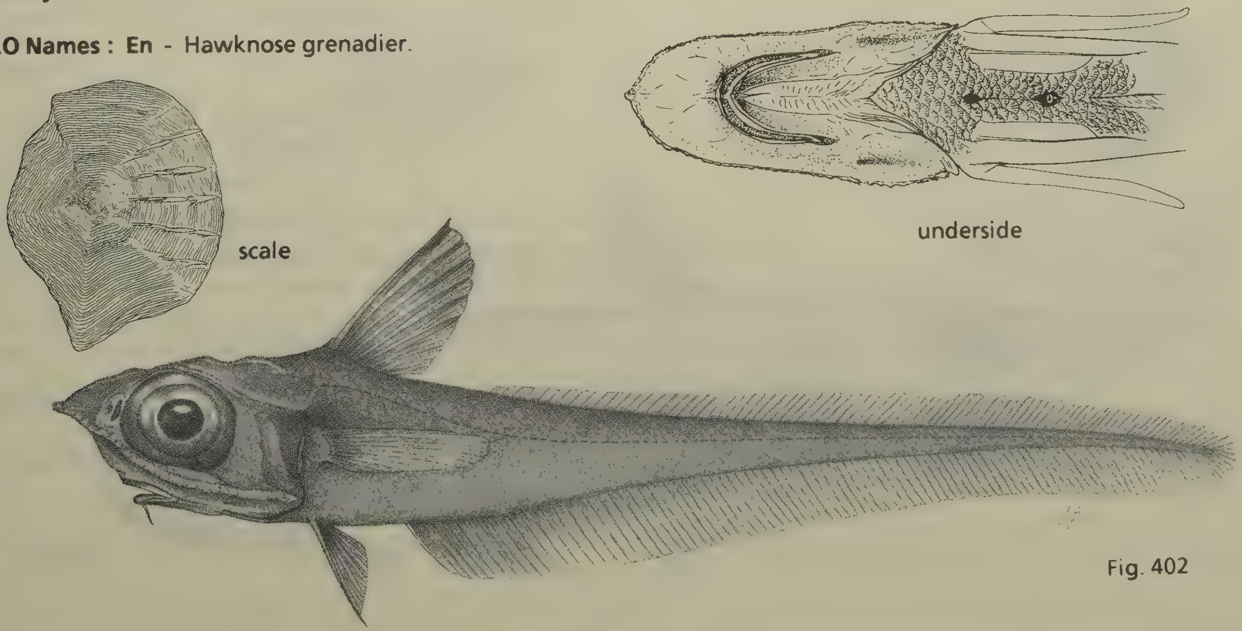
Fig. 402

MACROUR Coel 31

Scientific Name with Reference : ***Coelorhynchus oliverianus*** Phillipps, 1927a, Trans.New Zeal.Inst., 58:125 (Island Bay, New Zealand).

Synonyms : None.

FAO Names : En - Hawknose grenadier.


scale

underside

Fig. 402

Diagnostic Features : Snout bluntly pointed, high, a pronounced arch in dorsal profile, its anterolateral margin incompletely supported by bone; orbits huge, usually more than 40% of head length, much longer than snout and upper jaw, which are about 1/3 of head length; small teeth in long tapered bands in both jaws, the mandibular band about half width of premaxillary band; both extend posteriorly over 4/5 of rictus; inner gill rakers on first arch 2 + 10; head ridges narrow, conspicuous but not especially spiny except over parietal and postorbital ridges; underside of head completely naked. First dorsal fin with 2 spines and 8 to 10 rays; its height about equal to postrostral length of head; pectoral fin rays i14 to i17. Black naked fossa of light organ oval, between pelvic fin bases, separated from anus by several scale rows; anus remote from anal fin origin, separated by about 3 scale rows. Scales large, thin, rather deciduous; spinules on body scales short, conical, in 5 to 7 sparse divergent rows in large individuals; scales below midbase of first dorsal fin about 3 or 4. Pyloric caeca about 10. **Colour:** grey to grey-brown overall; head covering translucent, undersurface blackish and heavily punctate, especially around mouth and gill cover; fins dusky to blackish; mouth pale, gill cavity blackish.

Geographical Distribution : New Zealand (Fig. 403).

Habitat and Biology : Benthopelagic in 85 to 1 245 m depth, but adults most common in 400 to 600 m.

Size : To at least 35 cm total length.

Interest to Fisheries : Common in upper slope waters off New Zealand where they are frequently caught by commercial and research vessels (Peter McMillan, in litterature). McCann & McKnight (1980) recorded the species in 47 of 169 trawl catches off New Zealand, by far the most frequent occurrence of the 25 macrourid species studied by them.

Literature : McCann & McKnight (1980).

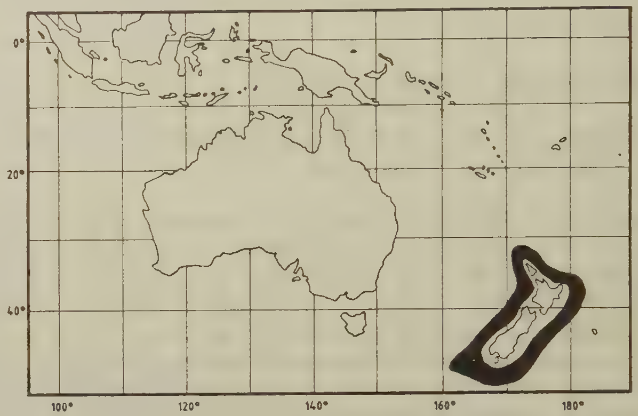


Fig. 403

Coelorinchus parallelus (Günther, 1877)

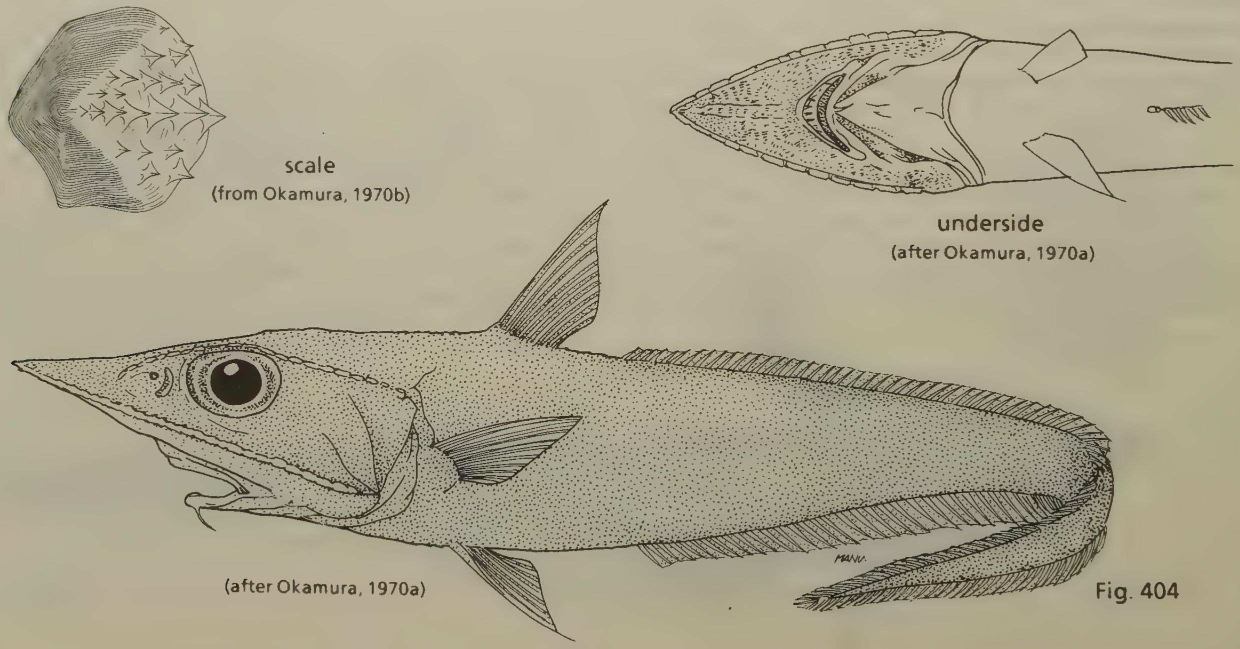
Fig. 404

MACROUR Coel 32

Scientific Name with Reference : ***Macrurus parallelus*** Günther, 1877, Ann.Mag.Nat.Hist., ser. 4, 20:439 (Enoshima, Japan).

Synonyms : ***Macrurus (Coelorhynchus) parallelus*** - Günther, 1877 (in part, specimens from Japan).

FAO Names : **En** - Spiny grenadier.


scale
(from Okamura, 1970b)

underside
(after Okamura, 1970a)

(after Okamura, 1970a)

Fig. 404

Diagnostic Features : Snout long, 42 to 48% of head length, its anterolateral margin slightly convex and incompletely supported by bone; orbit moderate in size, 23 to 27% of head length; upper jaw short, 22 to 26% of head length; suborbital width 50 to 63% of orbit diameter; orbit 1.7 to 1.8 times into snout; teeth in bands in both jaws; inner gill rakers on first arch 0 + 7; head ridges strong, spiny, supraoccipital and post-temporal ridges developed; scales on top of head and on occipital crest with a single spinous ridge; dorsal surface of snout completely scaled; underside of head, including mandibular rami, covered with scales having a single spinous ridge. First dorsal fin with 2 spines and 8 or 9 rays, no elongated rays, height about equal to postorbital length of head; pectoral fin rays i17 to i18. Light organ barely visible as a black crescent before anus. Body scales large, adherent; stout spinules on broad tripod bases in 1 to 6 parallel, ridge-like rows, middle row much enlarged; scales below midbase of first dorsal fin 4.5 to 5.5. Pyloric caeca about 9. **Colour:** overall brownish to greyish, fins dusky to black; no distinctive body or fin markings; mouth bluish-grey, gill cavity blackish; fins dusky.

Geographical Distribution : Southern Japan, East China Sea, and the Philippines, but may extend into Indian Ocean, Australia and New Zealand (Fig. 405).

Habitat and Biology : Benthopelagic in 630 to 990 m depth .

Size : To at least 48 cm total length.

Interest to Fisheries : Occasionally taken in trawls, but no separate catch statistics are maintained.

Local Names : JAPAN: Soroi-hige.

Literature : Günther (1877, 1887); Gilbert & Hubbs (1916, 1920); Okamura (1970a); Yatou, in Okamura & Kitayama (1984).

Remarks : Jordan & Gilbert (1904) considered Günther's Kermadec Island and New Zealand specimens as specifically distinct from the Japanese specimens and called them ***C. kermadecus*** n.sp. In their synonymy for ***C. parallelus***, Gilbert & Hubbs (1920:515) suggested that the New Zealand specimens represent a third species. Alcock's (1889) record of this species from Indian waters must be considered suspect as are those of Weber (1913) and Weber & de Beaufort (1929). Brauer's (1906) record of the species from southwestern Africa probably are misidentifications of ***C. braueri*** Barnard, 1925. Atlantic records of the species probably represent ***C. acanthiger*** Barnard, 1925. ***Coelorinchus parallelus*** probably has a distribution restricted to the western Pacific from Japan to the Philippines. Specimens reported from the Indian Ocean, East Indies, and New Zealand should be re- examined. Okamura (1970a:198) states that Japanese ichthyologists have also confused ***C. kamoharai*** and ***C. multispinulosus*** with ***C. parallelus***.

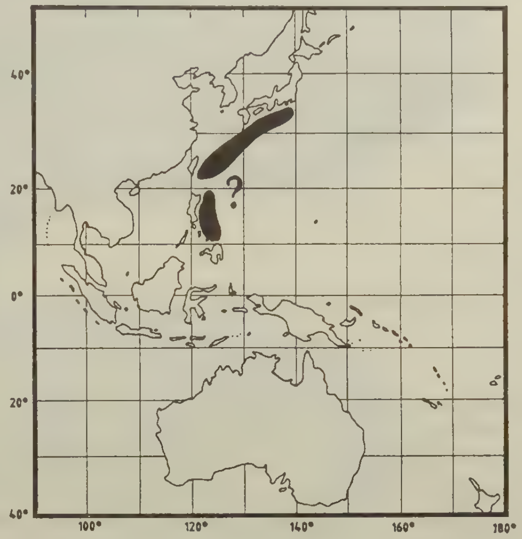


Fig. 405

Coelorinchus productus Gilbert & Hubbs, 1916

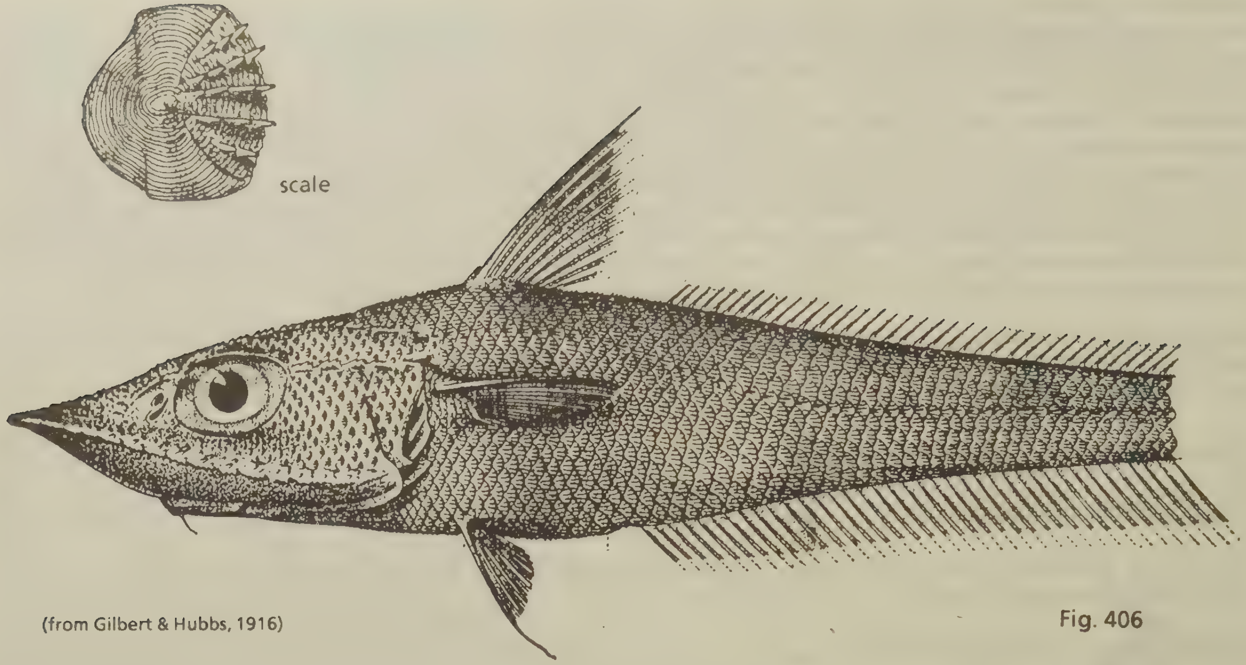
Fig. 406

MACROUR Coel 33

Scientific Name with Reference : ***Coelorhynchus productus*** Gilbert & Hubbs, 1916, Proc.U.S.Natl.Mus., 51:175, pl. 9, fig. 1 (Suruga Gulf, Japan, 360 to 543 m).

Synonyms : None.

FAO Names : **En** - Unicorn grenadier.



(from Gilbert & Hubbs, 1916)

Fig. 406

Diagnostic Features : Snout moderately long, pointed, 1.5 to 1.7 times into orbit diameter, 39 to 42% of head length, its anterolateral margin completely supported by bone, its sides convex in vertical view; orbit 26 to 29% of head length; upper jaw 22 to 23% of head length; barbel 5 or 6 times into orbit diameter; teeth in a broad, short band in premaxillary, the band falling well short of end of rictus; mandibular band longer, narrower; mouth opening restricted by folds of lip; inner gill rakers on first arch 1 or 2 + 5 or 6; head ridges strong, supraoccipital scute developed, several similar single-keeled scutes follow on nape; underside of head naked except for small patch below preopercle angle. First dorsal fin with 2 spines and 8 to 10 rays, second spinous ray about equal to or somewhat less than postrostral length of head; pectoral fin rays i16 to i18. Light organ small, length 2.8 to 3 times into orbit diameter; periproct slightly removed from anal fin origin, fossa of light organ narrow, extending forward immediately before anus, anterior end about equidistant from pelvic fin insertions and anal fin origin. Body scales covered with daggerlike spinules in 3 to 5 slightly divergent ridgelike rows, the median row strongest; scales below midbase of first dorsal fin 4.5. Pyloric caeca about 27. **Colour:** overall brownish to swarthy, silvery ventrally; fins dusky to blackish; no distinctive body or fin markings; mouth and gill cavities blackish.

Geographical Distribution : Japan (Suruga Bay) southward to East China Sea (Fig. 407).

Habitat and Biology : Benthopelagic in 271 to 600 m depth.

Size : To at least 31 cm total length.

Interest to Fisheries : Taken as bycatch by trawlers.

Local Names : JAPAN: Tengu-hige.

Literature : Gilbert & Hubbs (1916); Yatou in Okamura & Kitayama (1984).

Remarks : Closely related to *C. anatirostris*, with which it was formerly synonymized (Okamura, 1970a), but Yatou (in Okamura & Kitayama, 1984) recognized it as distinct from that species (see Remarks under *C. anatirostris*).

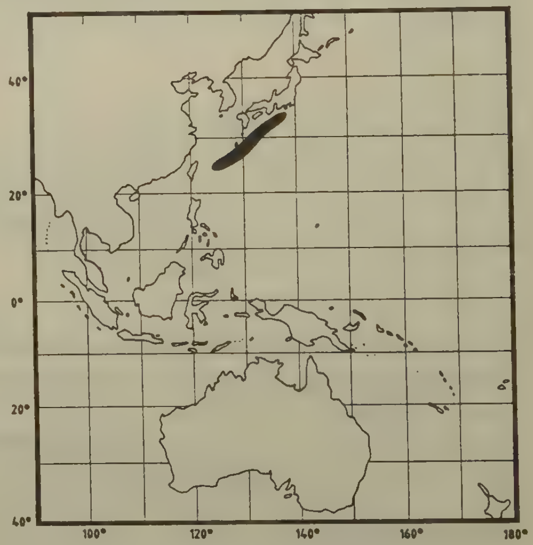


Fig. 407

Coelorinchus scaphopsis (Gilbert, 1890)

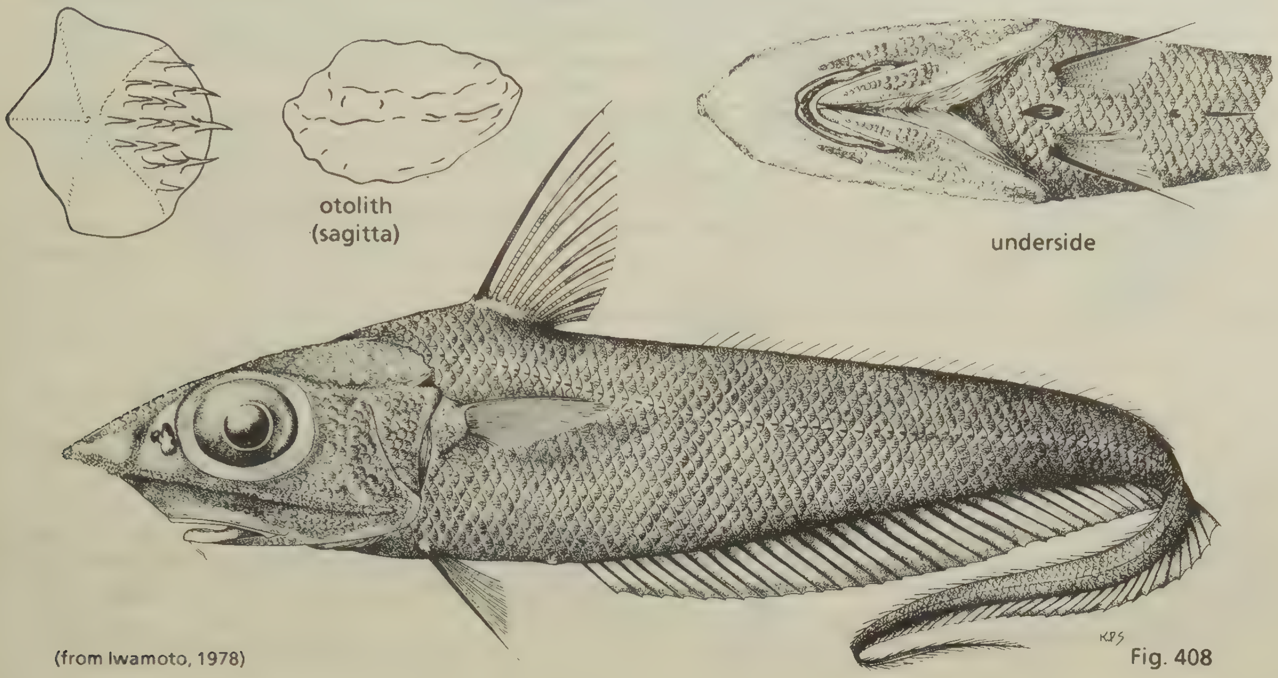
Fig. 408

MACROUR Coel 34

Scientific Name with Reference : ***Macrurus (Coelorhynchus) scaphopsis*** Gilbert, 1890, Proc.U.S.Natl. Mus., 13:115 (Gulf of California, 265 m).

Synonyms : ***Coelorhynchus scaphopsis*** - Goode & Bean, 1896.

FAO Names : En - Shoulderspot grenadier.



(from Iwamoto, 1978)

Fig. 408

Diagnostic Features : Snout relatively short, its antero-lateral margin incompletely supported by bone; terminal scute broad, blunt; orbit diameter 31 to 37% of head length, usually slightly more than snout length; upper jaws 28 to 32% of head length; teeth in narrow bands in both jaws; inner gill rakers on first arch 1 or 2 + 8 to 10; head ridges strong but not especially spiny; underside of snout naked; naked ventral margins on suborbital and mandible. First dorsal fin with 2 spines and 7 or 8 rays, its height usually less than postrostral length; pectoral fin rays i17 to i19. Anus slightly removed (1 to 3 scales) from anal fin origin; a large lens-shaped black fossa of light organ between pelvic fin bases. Body scales moderate in size, relatively adherent; spinules in 3 to 9 subparallel rows, middle row longest and slightly higher than others; scales below midbase of first dorsal fin 3.5 to 4.5. Swimbladder oval; 4 short, broad retia mirabilia and gas glands. Pyloric caeca 15 to 26. **Colour:** swarthy to greyish overall; fins dusky to blackish; mouth pallid; gill cavity blackish, paler inwardly.

Geographical Distribution : Southern California and northern Gulf of California; probably also in outer slope waters of Baja California and mainland Mexico(Fig. 409).

Habitat and Biology : Benthopelagic in 183 to 296 m depth.

Size : To at least 34 cm total length.

Interest to Fisheries : Commonest grenadier in upper Gulf of California (Lavenberg & Fitch, 1966), and occasionally taken by commercial trawlers fishing for Dover sole off Santa Barbara, California (Iwamoto, 1978).

Local Names : USA: Shoulderspot grenadier.

Literature : Gilbert (1890); Lavenberg & Fitch (1966); Iwamoto (1978).

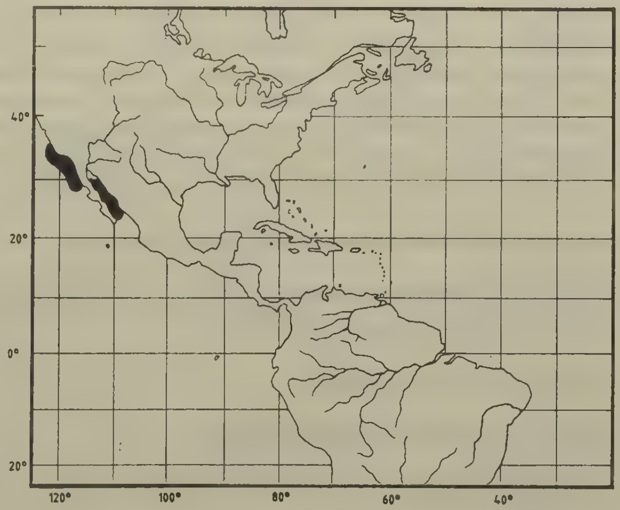


Fig. 409

Coelorinchus ventrilux Marshall & Iwamoto, 1973

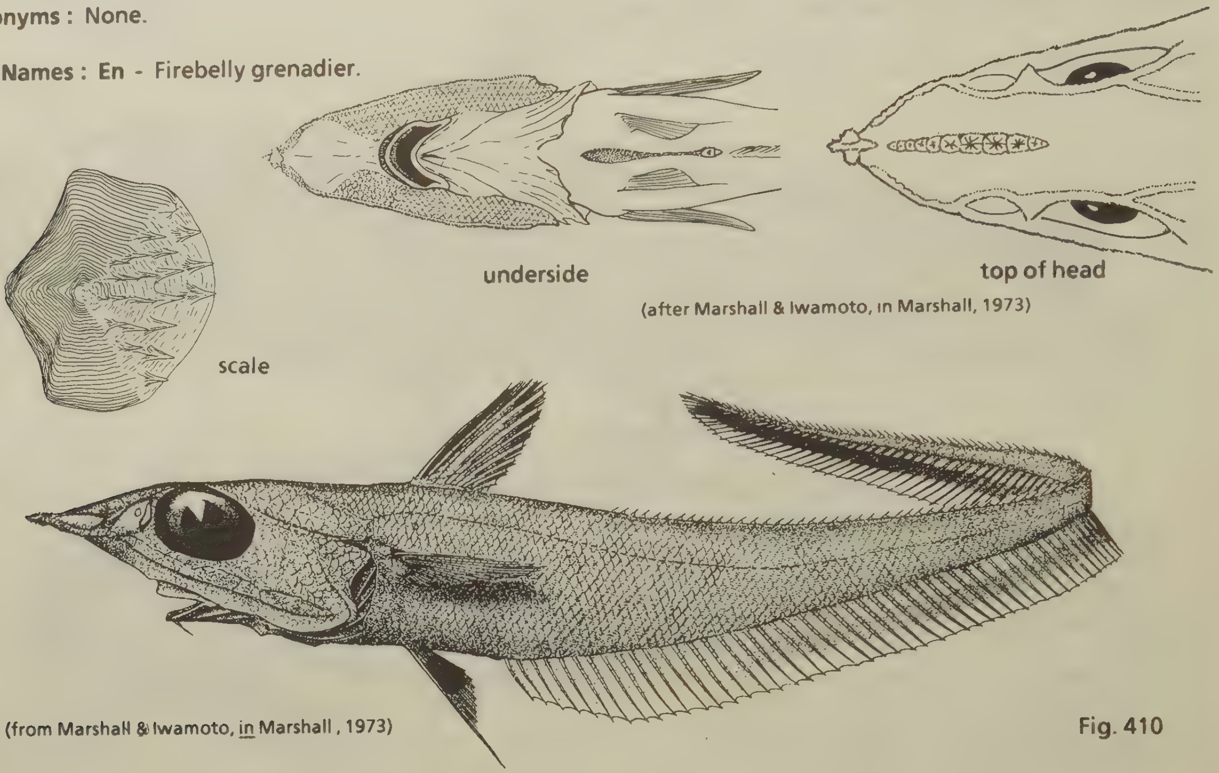
Fig. 410

MACROUR Coel 35

Scientific Name with Reference : *Coelorinchus ventrilux* Marshall & Iwamoto, in Marshall, 1973, Mem.Sears Found.Mar.Res., 1 (pt.6):543 (Florida Straits; 23°55'N, 80°34'W; 494 m).

Synonyms : None.

FAO Names : **En** - Firebelly grenadier.



(after Marshall & Iwamoto, in Marshall, 1973)

(from Marshall & Iwamoto, in Marshall, 1973)

Fig. 410

Diagnostic Features : Snout long, sharply pointed, 41 to 45% of head length; its anterolateral margin incompletely supported by bone; orbit diameter 27 to 31% of head length, somewhat larger than upper jaw, which is 24 to 28% of head length; inner gill rakers on first arch 7 to 9 total; head ridges strong but with short, generally conical spinules; terminal snout scute longer than wide, with blunt lateral arms; underside of snout naked medially; behind leading edges of snout dorsally, a broad transparent area on either side mostly lacking scales or with thin finely spinulated scales; leading edge ventrally with characteristic broadened scales; subopercle projects behind preopercle as a fairly broad tab. First dorsal fin with 2 spines and 9 or 10 rays, much shorter than postrostral length of head; pectoral fin rays i16 to i19. Light organ large, visible as a blackish streak leading from anus to a long black naked fossa on rear half of chest. Anus immediately anterior to anal fin origin. Scales covered with fine spinules arranged in parallel to slightly divergent rows; scales below midbase of first dorsal fin 4.5 to 5; below second dorsal fin origin 5. **Colour:** pale light greyish-brown to tawny, blackish or densely punctuate on belly and chest; oral cavity pale, branchial cavity blackish; a narrow median strip of dark punctuations ventrally on snout; membrane between second spinous ray and first segmented ray of first dorsal fin black; pectoral fins with large black blotch; anal fin dusky anteriorly becoming black-striped posteriorly.

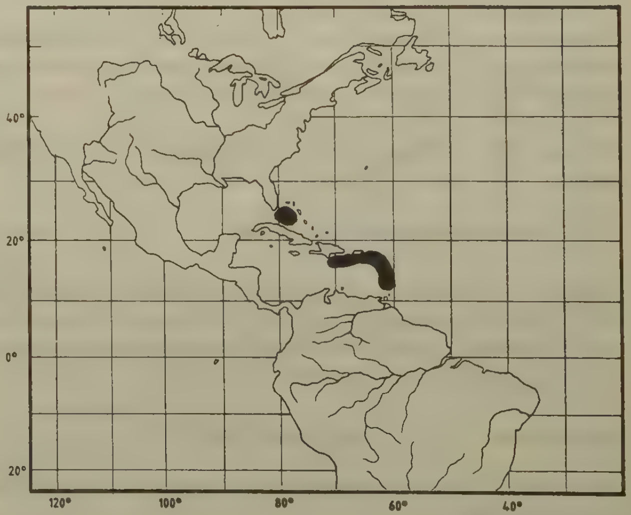


Fig. 411

Geographical Distribution : West Indies (Fig. 411).

Habitat and Biology : Benthopelagic in about 300 to 500 m depth over steep slopes of islands.

Size : To 30 cm total length.

Interest to Fisheries : None at present.

Literature : Marshall & Iwamoto (in Marshall, 1973).

Coryphaenoides Gunnerus, 1765

Genus with Reference : ***Coryphaenoides*** Gunnerus, 1765, K.Norske Vidensk.-Selsk.Skrift. Trondh., 3(4):50 (type species ***Coryphaenoides rupestris*** Gunnerus, 1765, by monotypy).

Synonyms : ***Moseleya*** Goode & Bean, 1896:417 (type species ***Coryphaenoides longifilis*** Günther, 1877, by original designation); ***Bogoslovius*** Jordan & Evermann, 1898:2570 (type species ***Bogoslovius clarki*** Jordan & Evermann, 1898, by original designation); ***Dolloa*** Jordan, 1900:897 (substitute for ***Moseleya*** Goode & Bean, 1896, preoccupied); ***Ateleobrachium*** Gilbert & Burke, 1912:94 (type species ***Ateleobrachium pterotum*** by original designation); ***Hemimacrurus*** Fraser-Brunner, 1935:322 (type species ***Macrurus acrolepis*** Bean, 1883, by original designation); ***Cariburus*** Parr, 1946:57 (type species ***Macrurus zaniophorus*** Vaillant, 1888, by original designation).

Diagnostic Features : Macrourines with 6 branchiostegal rays. Anus immediately before anal fin origin. Barbel present; dentition variable among species, from broad bands to 1 or 2 rows, but teeth never few and fang- like; snout moderately pointed to bluntly rounded, never greatly prolonged; outer gill slit usually greatly restricted; rakers on outer series of first arch often few and rudimentary. First dorsal fin with a serrated spinous ray (teeth sometimes rudimentary or mostly lost); pelvic fin rays 7 to 14. Precaudal vertebrae 11 to 16. Retia mirabilia and gas glands 4 to 7; retia usually slender and elongated. Pyloric caeca usually fewer than 20, stub-like to elongate.

Habitat Distribution and Biology : Worldwide in tropical to polar seas. Benthopelagic in about 300 to 6 100 m depth, but most species found between 700 and 2 000 m depth.

Size: To more than 120 cm, but most species less than 60 cm.

Interest to Fisheries : This genus includes some of the largest and commercially most important species of macrourids. The roundnose grenadier, ***Coryphaenoides ruspestris,*** of the North Atlantic is by far the most valuable macrourid for the fishing industry. As much as 80 000 t/year of the fish were harvested in the early 1970's, mostly off New Foundland, Labrador and Iceland. In more recent years, the catch has been under 50 000 t and catch quotas have been instituted to prevent overexploitation. The wide-ranging Pacific grenadier, ***Coryphaenoides acrolepis*** forms a small local fishery in the North Pacific off northern California and is being investigated for its potential in other areas. Other species are taken as incidental catch, and as such, are sometimes used for industrial purposes. Most species are found too deep and in too small a quantity to be of interest to fisheries.

Literature : Okamura (1970a); Marshall (1973); Iwamoto & Stein (1974).

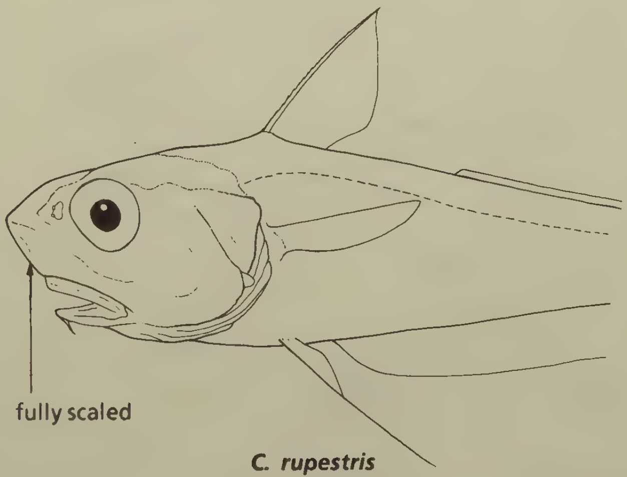
Remarks : Relationships within this large diverse genus have not been adequately worked out, and the subgeneric categories should be considered as tentative. ***Nematonurus***, ***Chalinura*** and ***Lionurus*** are treated as subgenera because of the author's inability to characterize each in a sátisfactory manner. The species listed under the three subgenera probably constitute natural groups, but whether or not they deserve full generic ranking is debatable. Others may chose to treat them as distinct genera. The subgenus ***Coryphaenoides*** as defined here is undoubtedly paraphyletic, and more detailed analyses of characters are necessary to understand relationships among the more than 44 species in that group.

Key to species :

1a. Upper jaw extends to posterior 1/3 of orbits or beyond

  2a. Inner gill rakers on first arch 17 to 20 (total)

    3a. Underside of head fully scaled; head large, broadly rounded; interorbital space 33 to 40% of head length; inner gill rakers on first arch 19 or 20 (total); outer gill slit 11 to 15% of head length .... *C. rupestris* (Fig. 412)



C. rupestris
(after Parr, 1946)

Fig. 412

3b. Underside of head mostly naked; head compressed, angular; interorbital space 21 to 25% of head length; inner gill rakers on first arch 17 to 19 (total); outer gill slit 21 to 27% of head length .... ***C. subserrulatus*** (Fig. 413)

2b. Inner gill rakers on first arch 9 to 16 (total)

4a. Outer pelvic fin rays greatly prolonged, greater than head length; scale rows below origin of second dorsal fin 12 to 15; barbel rudimentary, 2 to 4% of head length; first dorsal fin with 2 spines and 12 to 14 rays; inner gill rakers on first arch 14 to 16 (total); premaxillary teeth in 2 distinct rows, mandibular teeth in 1 row .... ***C. longifilis*** (Fig. 414)

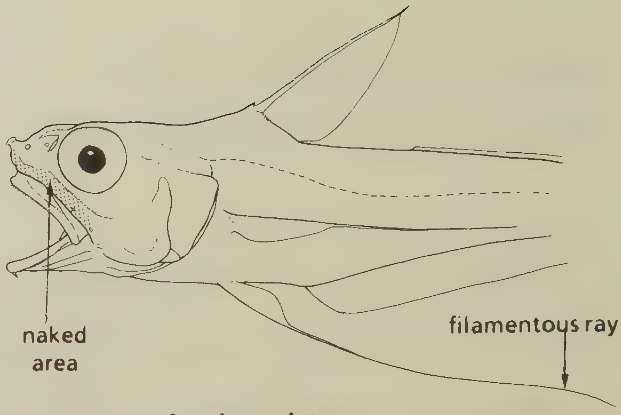
4b. Outer pelvic fin ray less than 1.5 times head length; scale rows below origin of second dorsal fin 4.5 to 10; barbel rudimentary to well developed, 0 to 37% of head length; first dorsal fin with 2 spines and 7 to 13 (rarely 14) rays; inner gill rakers on first arch 8 to 16 (total); premaxillary teeth in 1 row to a broad band, mandibular teeth in 1 row to a narrow band

5a. Mandibular teeth in 1 distinct row*

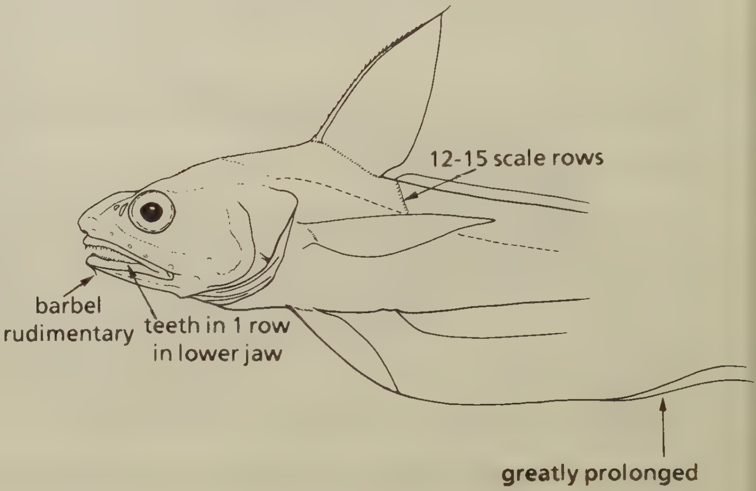
6a. Orbit diameter 30 to 38% of head length .. ***C. serrulatus*** (Fig. 415)

6b. Orbit diameter less than 30% of head length

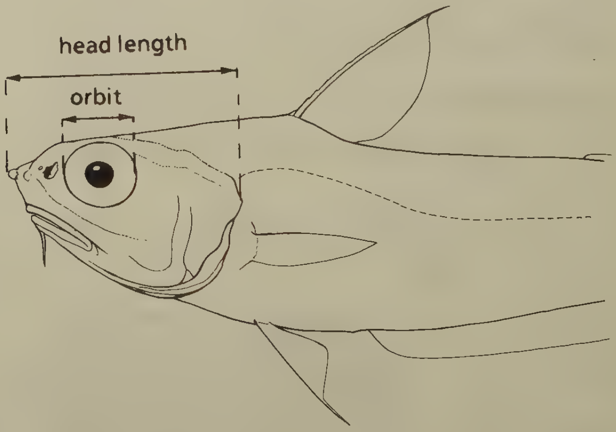
7a. Underside of snout almost entirely scaled



C. subserrulatus
(after Iwamoto in Smith & Heemstra, 1986)
Fig. 413



C. longifilis
(after Jordan & Gilbert, 1899)
Fig. 414



C. serrulatus
(after Günther, 1887)
Fig. 415

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* ***C. bulbiceps, C. paradoxus, C. rudis, C. thelostomus, C. carapinus*** have mandibular teeth in either 1 or 2 irregular rows

8a. One distinct row of small premaxillary teeth .... ***C. bulbiceps*** (Fig. 416)

8b. Two or more rows to a broad band of premaxillary teeth

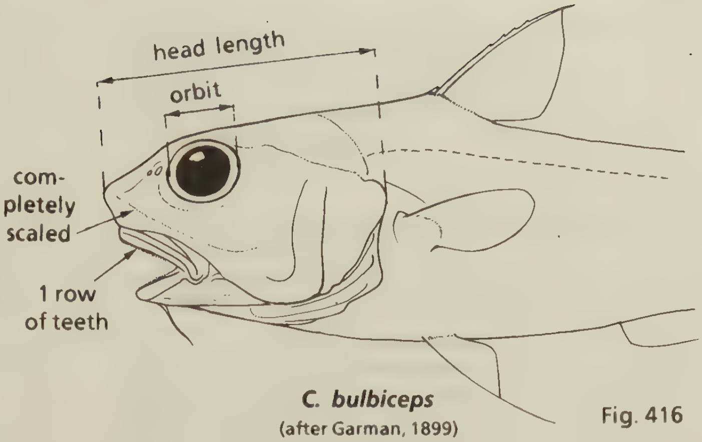
9a. Pelvic fins with 8 rays; barbel long, 30 to 33% of head length; orbits small, their diameter 15 to 16% of head length .... ***C. thelostomus*** (Fig. 417)

9b. Pelvic fins with 9 to 12 rays; barbel 8 to 23% of head length; orbits 15 to 28% of head length

10a. Inner gill rakers on first arch 12 to 14 (rarely 11); outer gill slit 18 to 22% of head length

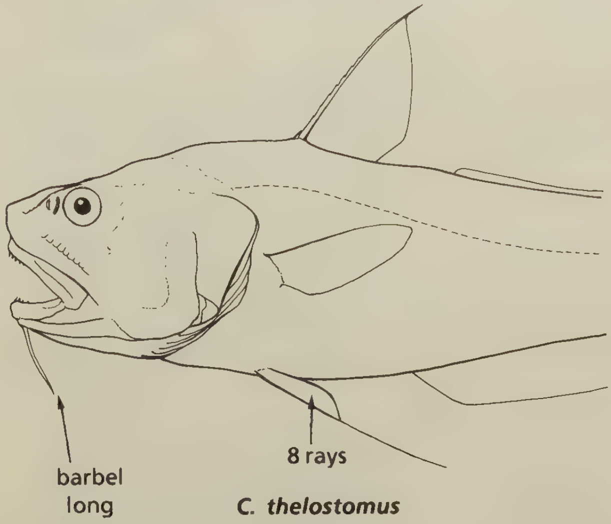
11a. Premaxillary teeth in a broad band; orbits 20 to 21% of head length; barbel 18 to 25% of head length .... ***C. striaturus*** (Fig. 418)

11b. Premaxillary teeth in 2 rows; orbit diameter 22 to 28% of head length; barbel 8 to 14% of head length .... ***C. lecointei*** (Fig. 419)


head length
orbit
com-
pletely
scaled
1 row
of teeth

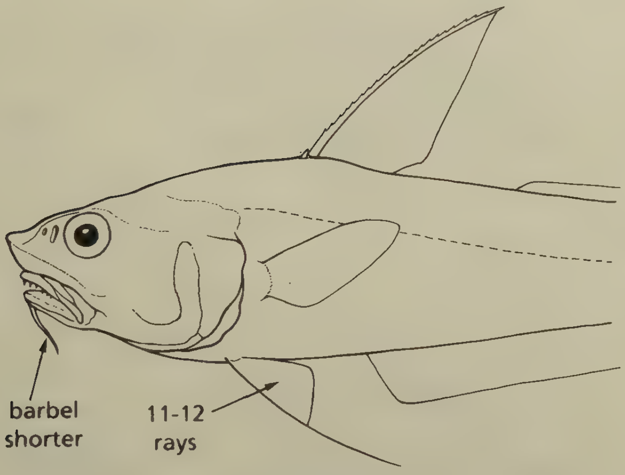
C. bulbiceps
(after Garman, 1899)

Fig. 416


barbel
long
8 rays

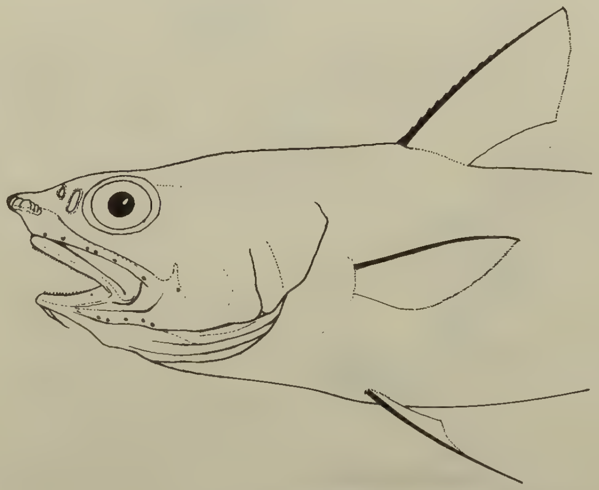
C. thelostomus
(after Maul, 1951)

Fig. 417


barbel
shorter
11-12
rays

C. striaturus
(after Smith, 1949)

Fig. 418



C. lecointei
(after Dollo, 1904)

Fig. 419

10b. Inner gill rakers on first arch about 10 (total); outer gill slit 4 to 9% of head length; barbel 10 to 23% of head length .. ***C. macrocephalus*** (Fig. 420)*
C. paradoxus (Fig. 421) *
C. rudis (Fig. 422) *

7b. Underside of snout mostly naked**

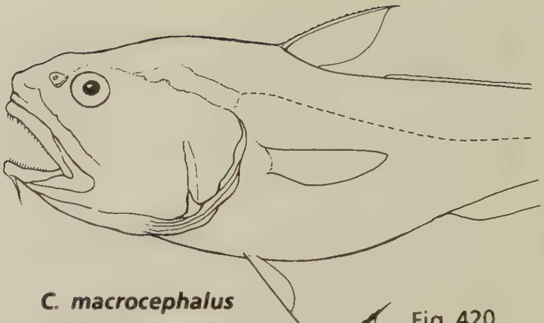
12a. Premaxillary teeth in a narrow to broad band

13a. Outer gill slit short, 8 to 9% of head length; orbit diameter 23 to 26% of head length; inner gill rakers on first arch 9 or 10 .... ***C. bucephalus*** (Fig. 423)

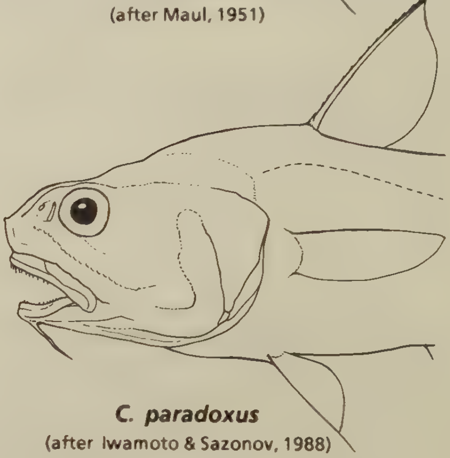
13b. Outer gill slit 14 to 30% of head length; orbit diameter 12 to 23% of head length; inner gill rakers on first arch 9 to 16

14a. Snout relatively long, pointed, 35 to 36% of head length; upper jaw of moderate length, 33 to 39% of head length .... ***C. carapinus*** (Fig. 424)

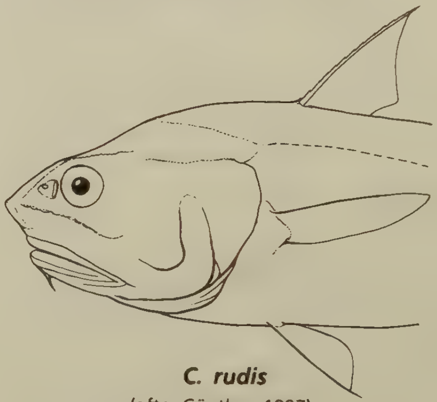
14b. Snout rather short, blunt or bluntly pointed, 24 to 33% of head length; upper jaw moderate to long, 34 to 49% of head length



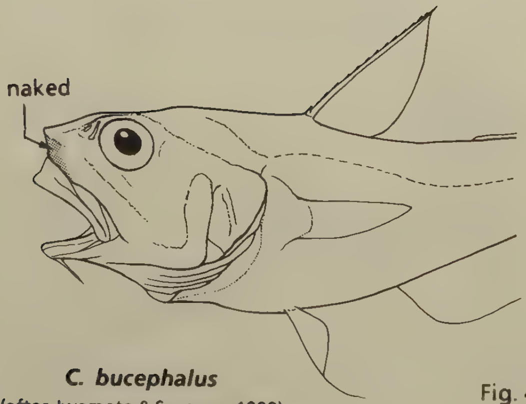
C. macrocephalus
(after Maul, 1951)
Fig. 420



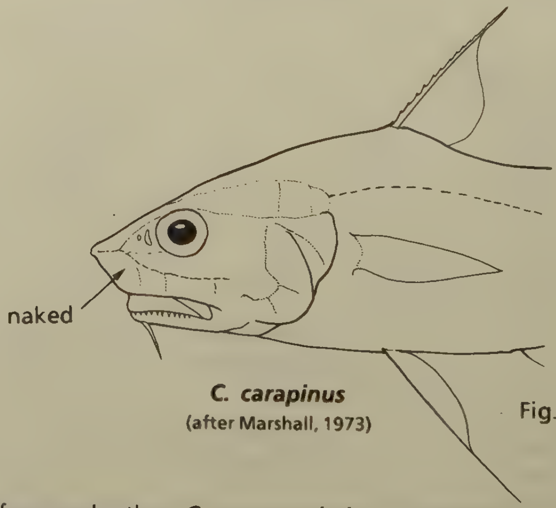
C. paradoxus
(after Iwamoto & Sazonov, 1988)
Fig. 421



C. rudis
(after Günther, 1887)
Fig. 422



C. bucephalus
(after Iwamoto & Sazonov, 1988)
Fig. 423



C. carapinus
(after Marshall, 1973)
Fig. 424

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* The author is unable to distinguish these three species from each other: ***C. macrocephalus, C. paradoxus*** and ***C. rudis***

** Including ***C. armatus, C. ferrieri, C. yaquinae***, all species of the subgenus ***Chalinura*** except ***striaturus*** and ***carapinus***

15a. Pelvic fins with 12 to 14 rays; inner gill rakers of first arch 15 or 16 (total) ... ***C mediterraneus*** (Fig. 425)

15b. Pelvic fins with 8 to 11 rays; inner gill rakers of first arch 9 to 16 (total)

16a. Barbel long, 25 to 26% of head length; interorbital space broad, 28 to 34% of head length .... ***C. murrayi*** (Fig. 426)

16b. Barbel short to moderate, 5 to 23% of head length; interorbital space narrow to broad, 22 to 35% of head length

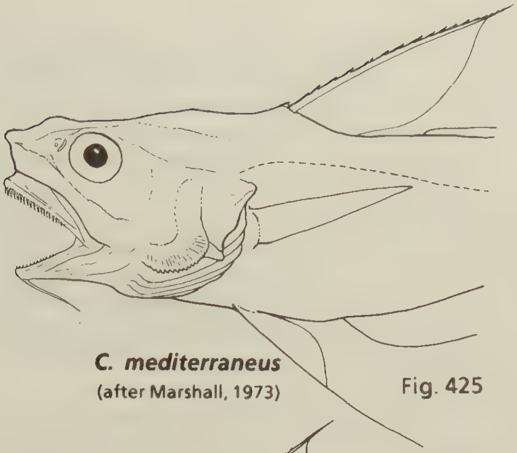
17a. Snout blunt, scarcely protruding beyond mouth; premaxillary teeth in a broad band

18a. Barbel 16 to 23% of head length .... ***C. leptolepis**** (Fig. 427)
C. liocephalus* (Fig. 428)

18b. Barbel 5 to 18% of head length

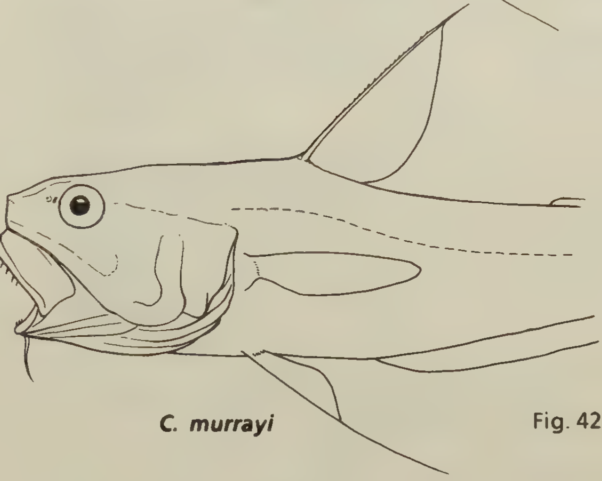
19a. Pelvic fins with 8 or 9 rays; interorbital space 32 to 35% of head length; barbel 9 to 12% of head length . ***C. brevibarbis*** (Fig. 429)

19b. Pelvic fin with 8 to 11 rays; interorbital space about 22 to 33% of head length; barbel 5 to 18% of head length



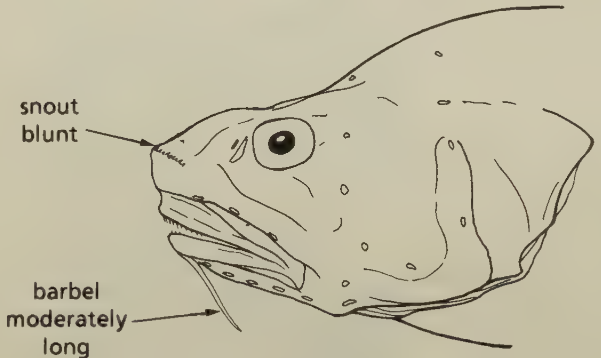
C. mediterraneus
(after Marshall, 1973)

Fig. 425



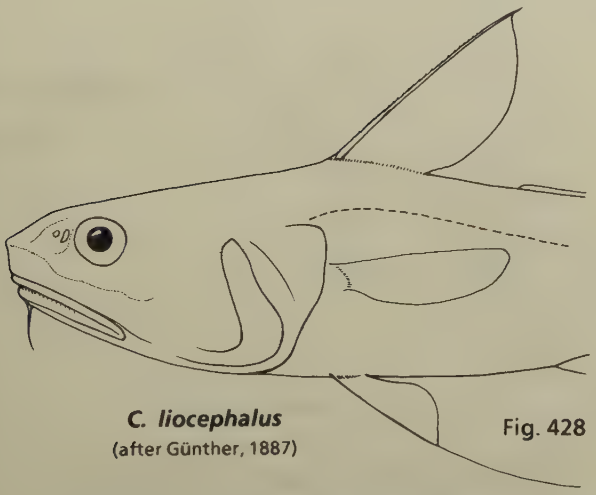
C. murrayi

Fig. 426



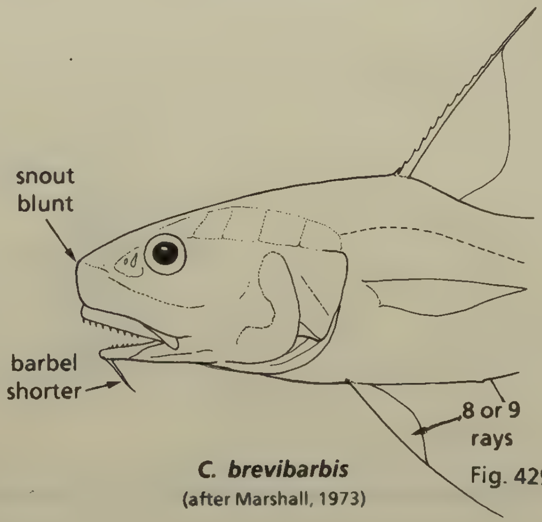
C. leptolepis
(after Iwamoto & Stein, 1974)

Fig. 427



C. liocephalus
(after Günther, 1887)

Fig. 428



C. brevibarbis
(after Marshall, 1973)

Fig. 429

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* The author is unable to differentiate these two species

20a. Pelvic fins with 8 or 9 rays; first dorsal fin with 2 spines and 7 or 8 rays; barbel 5 to 9% of head length; orbit diameter 12 to 18% of head length .. ***C. profundicolus***
(Fig. 430)

20b. Pelvic fins with 9 to 11 rays; first dorsal fin with 2 spines and 7 to 10 rays; barbel about 10 to 17% of head length; orbit diameter about 17 to 20% of head length

21a. First dorsal fin with 2 spines and 7 rays; interorbital space about 30% of head length .. ***C. fernandezianus***
(Fig. 431)

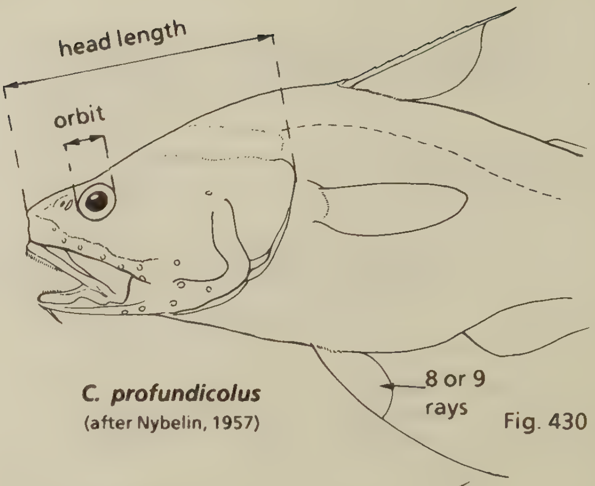
21b. First dorsal fin with 2 spines and 8 to 10 rays; interorbital space about 22 to 25% of head length .. ***C. leptolepis****
(Fig. 427)
C. liocephalus*
(Fig. 428)

17b. Snout pointed; premaxillary teeth in a narrow band

22a. Pelvic fin rays usually 11; inner gill rakers on first arch 9 to 12 (total); upper jaw 34 to 36% of head length; snout 30 to 33% of head length; outer gill slit 15 to 19% of head length .... ***C. ferrieri***
(Fig. 432)

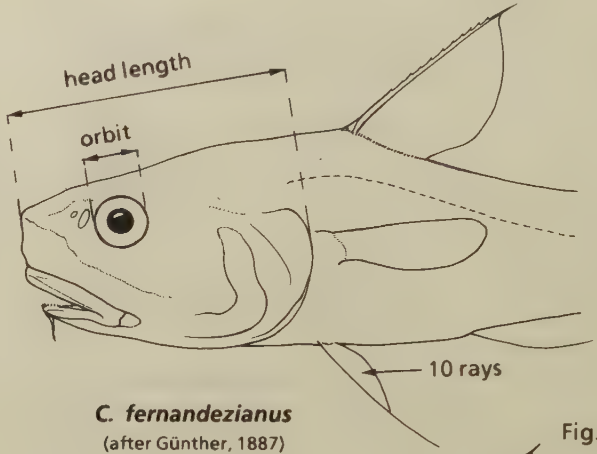
22b. Pelvic fin rays usually 10; inner gill rakers on first arch 11 or 12; upper jaw 39 to 40% of head length; snout 26 to 30% of head length; outer gill slit 18 to 20% of head length .... ***C. yaquinae***
(Fig. 433)

12b. Premaxillary teeth in 1 or 2 distinct rows



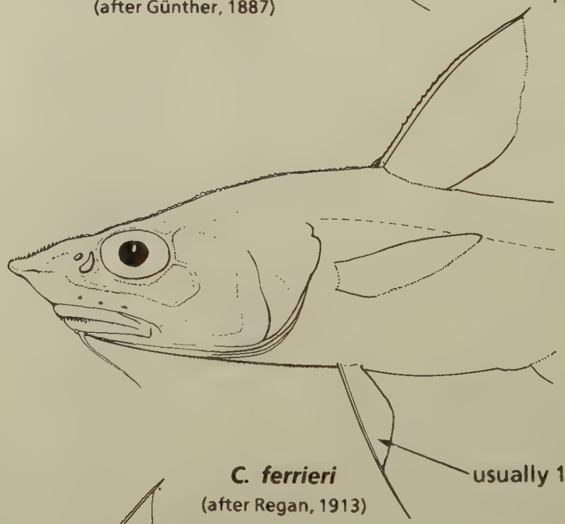
C. profundicolus
(after Nybelin, 1957)

Fig. 430



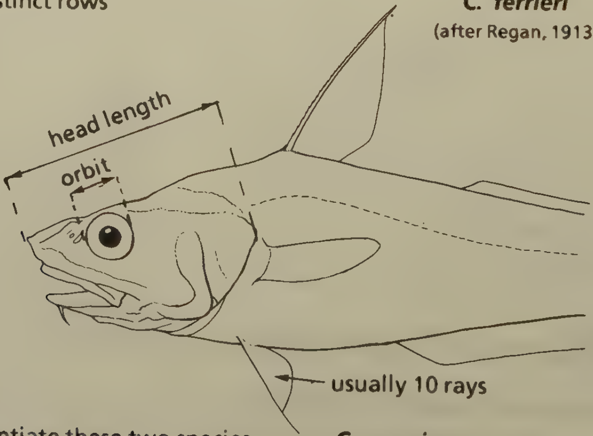
C. fernandezianus
(after Günther, 1887)

Fig. 431



C. ferrieri
(after Regan, 1913)

Fig. 432



C. yaquinae

Fig. 433

* The author is unable to differentiate these two species

23a. Premaxillary teeth in 1 or 2 rows; jaw teeth short, conical, slightly flanged near tips, giving a bluntly arrowhead-like tip; outer gill slit 12 to 18% of head length .... ***C. armatus*** (Fig. 434)

23b. Premaxillary teeth in 2, sometimes irregular rows; jaw teeth slender, sharp, and without an arrowhead-like tip; outer gill slit 18 to 25% of head length

24a. Orbit diameter 19 to 21% of head length; snout 26 to 30% of head length .... ***C. yaquinae*** (Fig. 433)

24b. Orbit diameter about 25% of head length; snout about 25% of head length .... ***C. affinis*** (Fig. 435)

5b. Mandibular teeth in 2 rows to a broad band

25a. Underside of snout variously naked

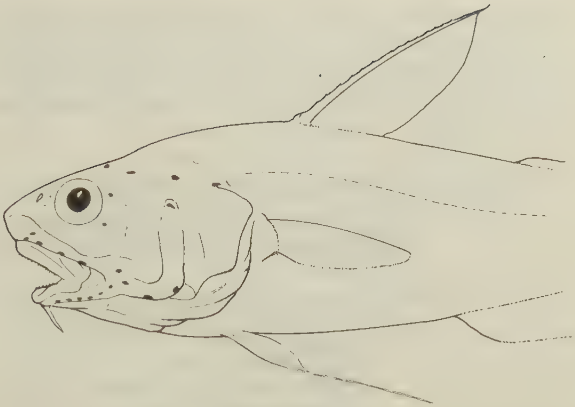
26a. No barbel visible; pelvic fin rays 8; first dorsal fin rays with 2 spines and 8 rays .... ***C. sibogae****

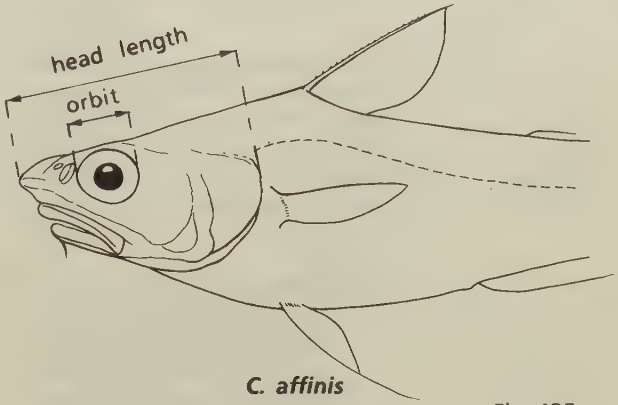
26b. Barbel rudimentary to long; pelvic fin rays 7 to 11; first dorsal fin with 8 to 12 rays (rarely 14 rays)

27a. Pelvic fin rays 7 or 8 (rarely 9); barbel 11 to 19% of head length; numerous stout, deeply embedded scales form a firm sub-orbital shelf and leading horizontal snout edges

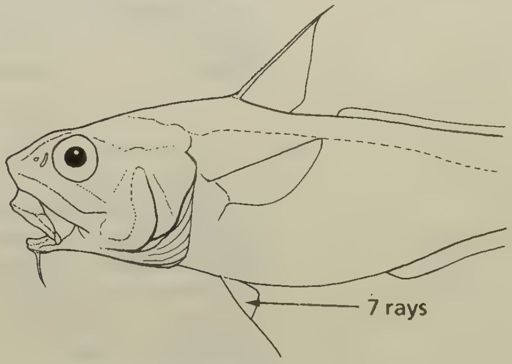
28a. Pelvic fin rays 7; scales with small, fine spinules in parallel rows; pyloric caeca 14 or 15 .... ***C. hextii*** (Fig. 436)

28a. Pelvic fin rays 8 (rarely 9); scales with rather strong spinules in 3 to 5 divergent rows; pyloric caeca 11 to 14 ..... ***C. acrolepis*** (Fig. 437)

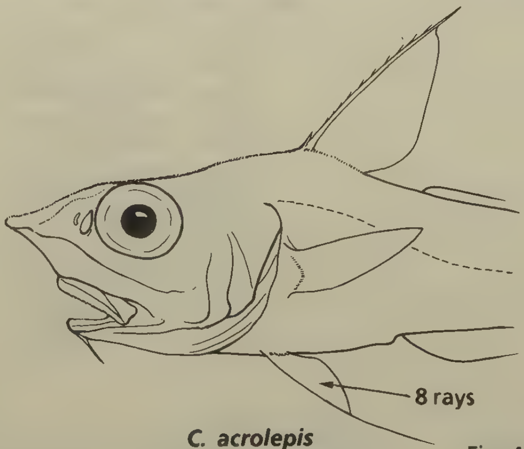

C. armatus Fig. 434



C. affinis
(after Günther, 1887) Fig. 435



C. hextii
(after Alcock, 1899) Fig. 436



C. acrolepis
(after Jordan & Gilbert, 1899) Fig. 437

* Species described from a small, immature, mutilated specimen and never illustrated

27b. Pelvic fin rays 9 to 11 (rarely 8 in *C. cinereus*); barbel 3 to 15% of head length; suborbital and leading edges of snout variously naked to moderately coarsely armed with scute-like scales

29a. Orbit diameter 23% of head length or less; snout rather strongly pointed, length 30 to 38% of head length

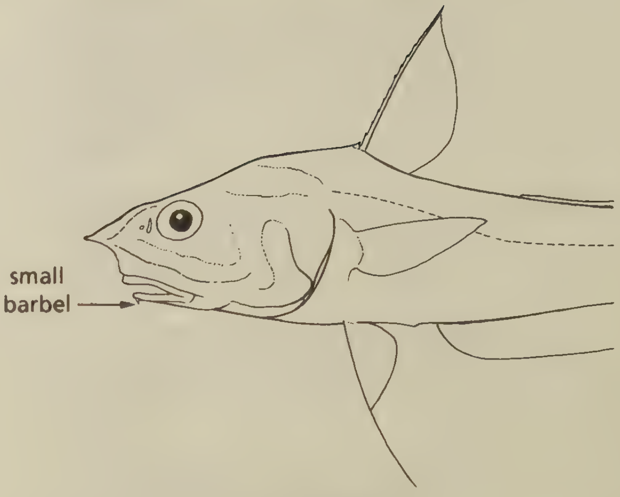
30a. Barbel rudimentary to about 3% of head length; first dorsal fin with 2 spines and 11 rays; orbit diameter 23% of head length, upper jaw 32% of head length .... *C. orthogrammus* (Fig. 438)

30b. Barbel rudimentary to moderately long, 4 to 15% of head length; first dorsal fin with 2 spines and 8 to 11 rays; orbit diameter 16 to 22% of head length; upper jaw 33 to 39% of head length

31a. Scales on suborbital form a coarse spiny shelf; scales fairly adherent, 6.5 to 8 below midbase of first dorsal fin; isthmus to anal fin distance 113 to 122% of head length; interorbital space 22 to 26% of head length .... *C. ferrieri* (Fig.432)

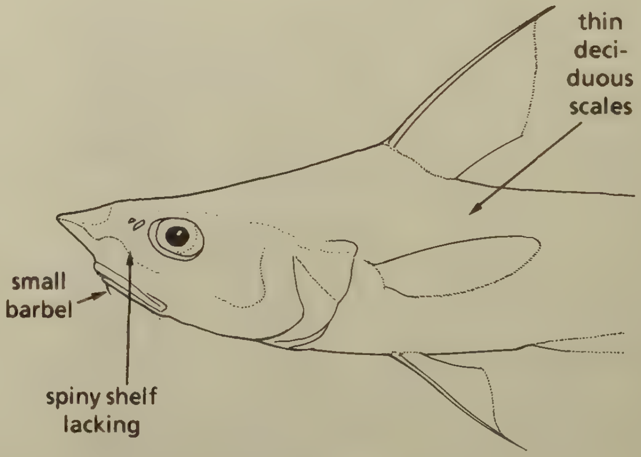
31b. Scales weak, deciduous, not forming a coarse spiny suborbital shelf; about 4 to 5.5 scales below midbase of first dorsal fin; distance from isthmus to anal fin 76 to 106% of head length; interorbital space 31 to 40% of head length

32a. Outer gill rakers on first arch rudimentary, 3 to 6 total, those on inner side 8 to 10 total; serrations obsolete on long spine of first dorsal fin; barbel 4 to 9% of head length; interorbital space 31 to 33% of head length .. *C. filicaudus* (Fig. 439)



C. orthogrammus
(after Radcliffe, 1912)

Fig. 438



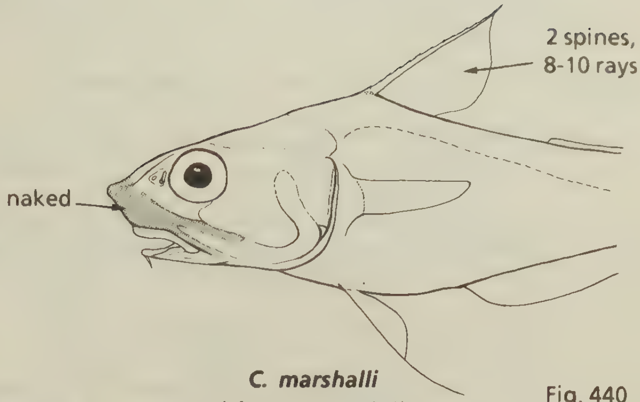
C. filicaudus
(after Günther, 1887)

Fig. 439

32b. Outer gill rakers on first arch somewhat spatulate and tab-like, 6 to 11 total, those on inner side of arch 10 to 12 total; serrations on long spine of first dorsal fin well developed; barbel 8 to 14% of head length; interorbital space 34 to 40% of head length .... ***C. carapinus*** (Fig. 424)

29b. Orbit diameter moderate to large, 23 to 34% of head length; snout moderately pointed, length 25 to 32% of head length

33a. First dorsal fin with 2 spines and 8 to 10 rays; inner gill rakers on first arch 9 to 11; upper jaw 30 to 35% of head length; almost entire dorsal and ventral surfaces of snout naked, except scutes at terminal and lateral angles; suborbital region broadly naked anteroventrally .... ***C. marshalli*** (Fig. 440)

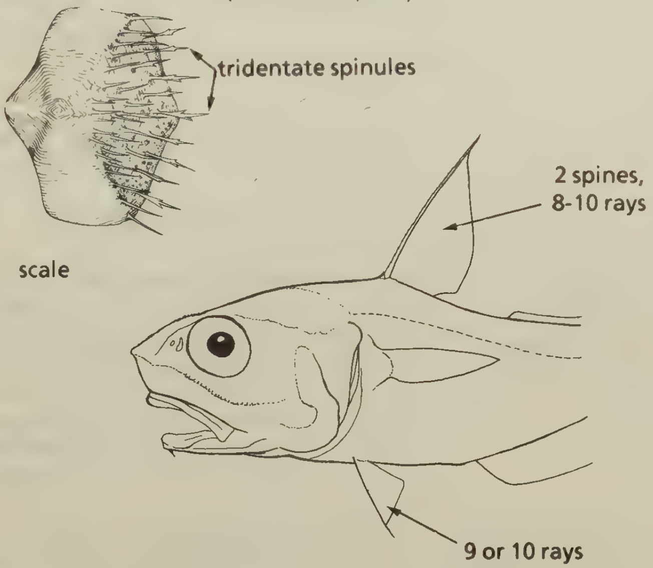


C. marshalli
(after Iwamoto, 1970)

Fig. 440

33b. First dorsal fin with 2 spines and 8 to 12 (rarely 14) rays; inner gill rakers on first arch 11 to 14 total; upper jaws 35 to 41% of head length; snout ventrally mostly naked, dorsally naked only along leading edges; suborbital mostly scaled

34a. Body scales in adults with tridentate spinules; first dorsal fin with 2 spines and 8 to 10 (rarely 11) rays; length of outer gill slit 11 to 17% of head length .... ***C. delsolari*** (Fig. 441)

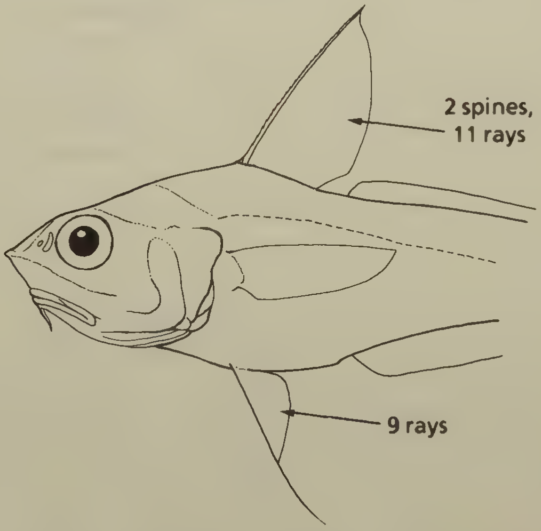


C. delsolari
(after Chirichigno & Iwamoto, 1977)

Fig. 441

34b. Spinules on scales all conical, needle-like, without tridentate tips; first dorsal fin with 2 spines and 10 to 12 rays; length of outer gill slit 18 to 20% of head length

35a. Barbel 8 to 9% of head length; orbit diameter about 26 to 28% of head length .... ***C. filamentosus*** (Fig. 442)



C. filamentosus
(after Okamura, 1970)

Fig. 442

35b. Barbel 2 to 8% of head length; orbit diameter 27 to 34% of head length .... *C. cinereus* (Fig. 443)

25b. Underside of snout essentially completely scaled

36a. First dorsal fin with 2 spines and 8 rays; pelvic fin rays 8; barbel lacking .... ***C. sibogae***

36b. First dorsal fin with 2 spines and 8 to 14 rays; pelvic fin rays 7 to 11; barbel rudimentary to well developed, 3 to 33% of head length

37a. Pelvic fin rays 7 or 8 (rarely 9)

38a. Premaxillary teeth small, in 1 distinct row .... ***C. bulbiceps*** (Fig.416)

38b. Premaxillary teeth in 2 rows to a broad band

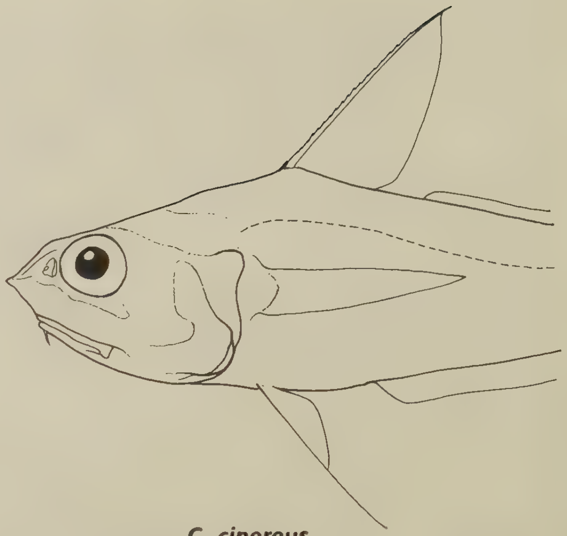
39a. Pelvic fin rays 7 .... ***C. hextii*** (Fig.436)

39a. Pelvic fin rays 8 (rarely 9)

40a. Inner gill rakers on first arch 11 to 13; barbel 11 to 19% of head length; interorbital space 18 to 24% of head length; body scales with short conical spinules in 3 to 5 divergent rows .... ***C. acrolepis*** (Fig.437)

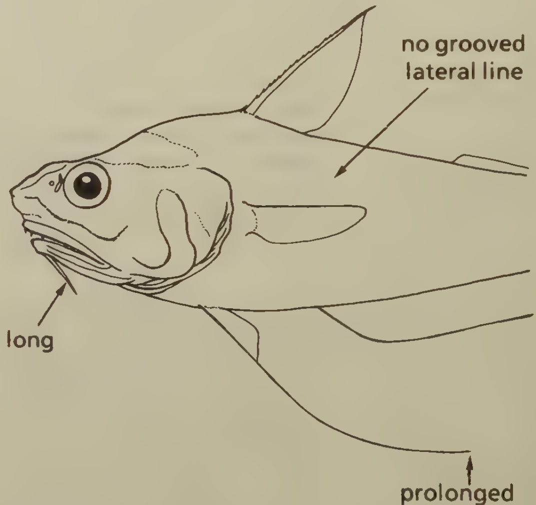
40b. Inner gill rakers on first arch 8 or 9; barbel 19 to 33% of head length; interorbital space 24 to 33% of head length; body scales with long, slender spinules in parallel to slightly convergent rows

41a. Barbel 19 to 25% of head length; orbits 23 to 27% of head length; upper jaw 31 to 33% of head length; no lateral-line groove .... ***C. alateralis*** (Fig. 444)



C. cinereus
(after Iwamoto & Stein, 1974)

Fig. 443



C. alateralis
(after Marshall & Iwamoto in Marshall, 1973)

Fig. 444

41b. Barbel 30 to 33% of head length; orbit diameter 15 to 16% of head length; upper jaw 36 to 39% of head length; a distinct lateral-line groove present .... ***C. theleostomus*** (Fig.417)

37b. Pelvic fin rays 9 to 11*

42a. First dorsal fin with 2 spines and 12 or 13 (rarely 11 or 14) rays; inner gill rakers on first arch 12 to 14 total

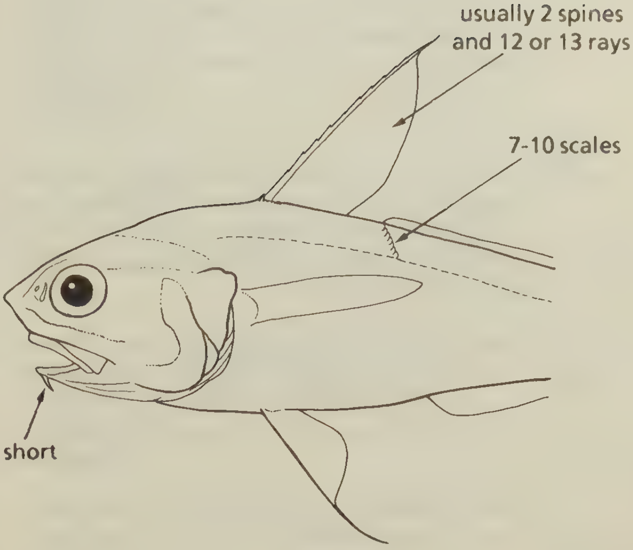
43a. Outer pelvic ray extends to beyond anus; scales below second dorsal fin origin 7 to 10 .. ***C. filifer*** (Fig. 445)

43b. Outer pelvic ray falls well short of anus; scales below second dorsal fin origin about 12 .... ***C. altipinnis*** (Fig.446)

42b. First dorsal fin with 2 spines and 8 to 11 rays; inner gill rakers on first arch less than 12

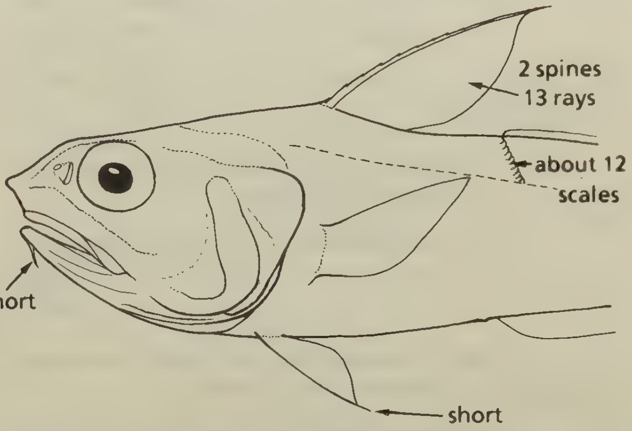
44a. Scales small, about 14 or 15 below origin of first dorsal fin, about 12 below origin of second dorsal fin .... ***C. camurus*** (Fig. 447)

44b. Scales larger, about 8 to 10 below origin of first dorsal fin, 4.5 to 8 below origin of second dorsal fin


usually 2 spines and 12 or 13 rays
7-10 scales
short

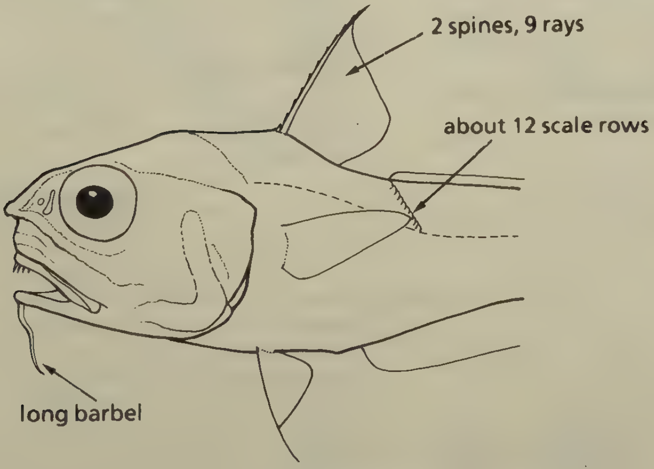
C. filifer
(after Iwamoto & Stein, 1974)

Fig. 445


2 spines
13 rays
about 12
scales
short
short

C. altipinnis
(after Günther, 1887)

Fig. 446


2 spines, 9 rays
about 12 scale rows
long barbel

C. camurus
(after Radcliffe, 1912)

Fig. 447

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* The following species would key out here if 5b were chosen rather than 5 a: ***C. macrocephalus, C. paradoxus, C. rudis***

45a. Barbel small, 5 to 9% of head length; a large, stout terminal scute at snout tip; upper jaw extends posteriorly only to posterior 1/3 of orbit or less; orbit diameter 26 to 34% of head length .... *C. mexicanus* (Fig. 448)

45b. Barbel moderate to large, 10 to 20% of head length; terminal snout scute not especially large and stout; upper jaw extends to below posterior edge of orbits; orbit diameter 15 to 26% of head length

46a. Length of first dorsal fin greater than postrostral length of head; outer pelvic fin ray about 3/4 length of head or more .... ***C. longicirrhus*** (Fig. 449)

46b. Length of first dorsal fin less than postrostral length of head; outer pelvic fin ray about 2/3 length of head or less .... ***C. macrocephalus*** (Fig. 420)
C. paradoxus (Fig. 421)
C. rudis (Fig. 422)

1b. Upper jaw falls short of reaching below posterior 1/3 of orbits

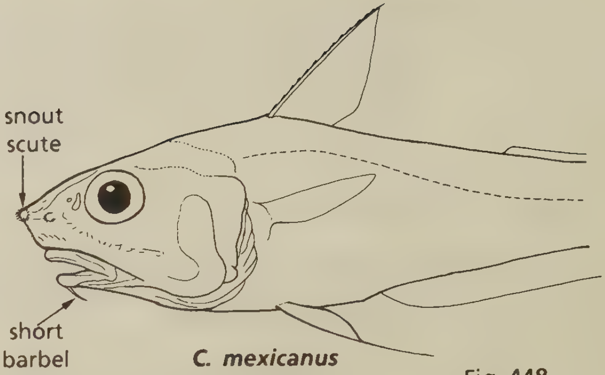
47a. An extremely long dorsal spine, usually 1.5 or more times the head length

48a. Preopercle margin acutely angulated at posteroventral corner .. ***C. macrolophus*** (Fig. 450)

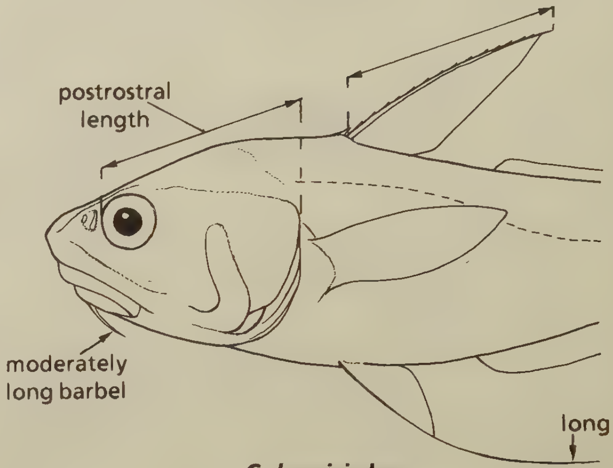
48b. Preopercle margin broadly rounded at posteroventral corner

49a. Orbit diameter very small, about 17% of head length ... ***C. microps*** (Fig. 451)

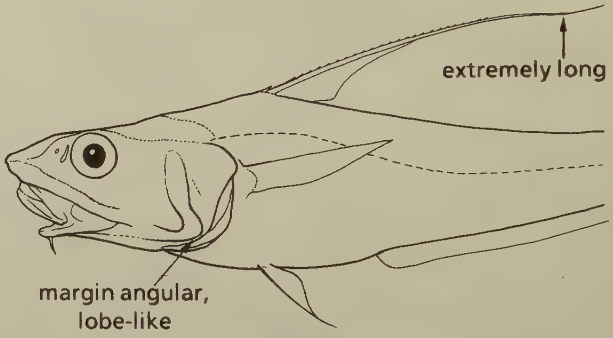
49b. Orbit diameter moderate, 20 to 34% of head length


snout
scute
short
barbel

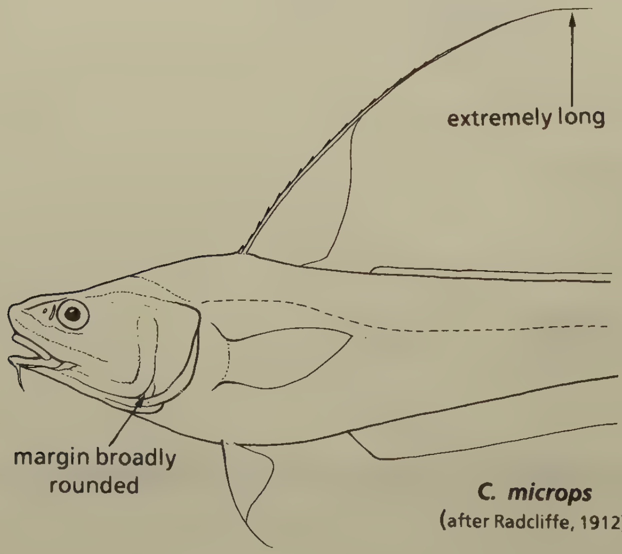
C. mexicanus
(after Parr,1946)
Fig. 448


postrostral
length
moderately
long barbel
long

C. longicirrhus
(after Gilbert, 1905)
Fig. 449


extremely long
margin angular,
lobe-like

C. macrolophus
(after Alcock, 1899)
Fig. 450


extremely long
margin broadly
rounded

C. microps
(after Radcliffe, 1912)
Fig. 451

50a. Interorbital space about 1.5 to 1.6 times into orbit diameter .... ***C. marginatus*** (Fig. 452)

50b. Interorbital space about 1.0 to 1.2 times into orbit diameter

51a. Inner gill rakers of first arch 8 or 9 (total); distance from isthmus to anal fin origin 98 to 108% of head length; interspace between first and second dorsal fins 1.0 to 1.25 length of first dorsal fin base .... ***C. tydemani*** (Fig.453)

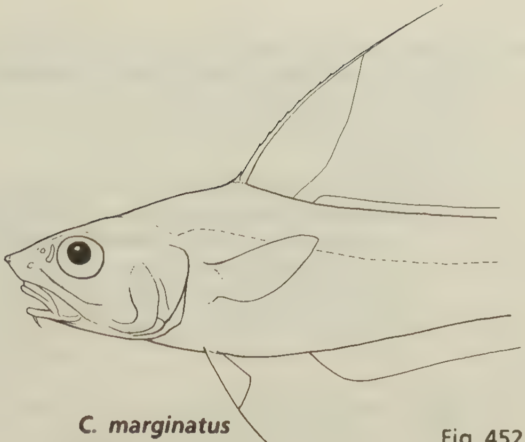
51b. Inner gill rakers of first arch 11 (total); distance from isthmus to anal fin origin 84 to 93% of head length; interspace between first and second dorsal fins 1.3 to 2.3 length of first dorsal fin base .... ***C. semiscaber*** (Fig. 454)

47b. Length of longest first dorsal fin spine usually 1.2 of head length or less

52a. Most of ventral surfaces of snout and suborbital space naked

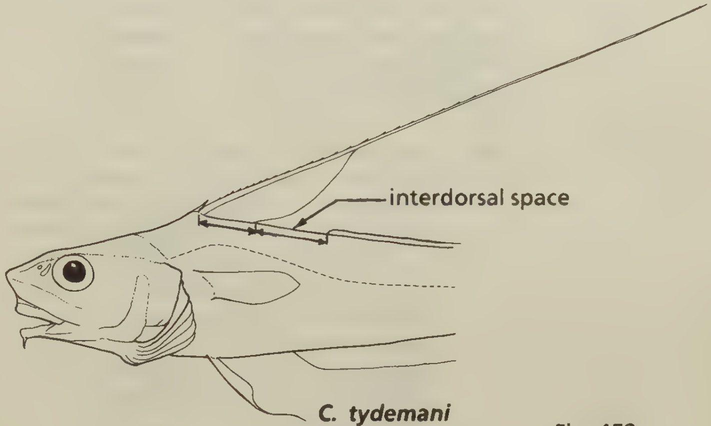
53a. Snout rather blunt and high, scarcely protruding beyond front of mouth, median tubercle on snout tip absent; upper jaws moderately large, 36 to 39% of head length, extending to about midorbit; diameter of orbits 22 to 25% of head length; scales below origin of second dorsal fin 6.5 to 9.5, lateral-line scales over a distance equal to predorsal length, about 45 to 49; pelvic fin rays 9 or 10; inner gill rakers on first arch 9 to 11 total .. ***C. oreinos*** (Fig. 455)

53b. Snout pointed, protruding, a distinct tubercular scale at snout tip; upper jaws moderate to small, 24 to 35% of head length, extending to midorbit or forward of that vertical; diameter of orbits 21 to 36% of head length; scales below origin of second dorsal fin 4.5 to 8.5, lateral-line scales over a distance equal to predorsal length, 31 to 55; pelvic fin rays 7 to 9, occasionally 10; inner gill rakers on first arch 7 to 14



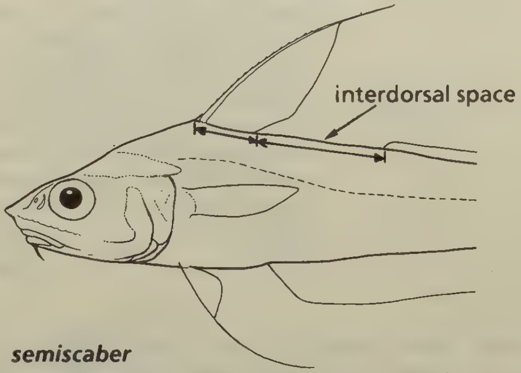
C. marginatus
(after Okamura, 1970a)

Fig. 452



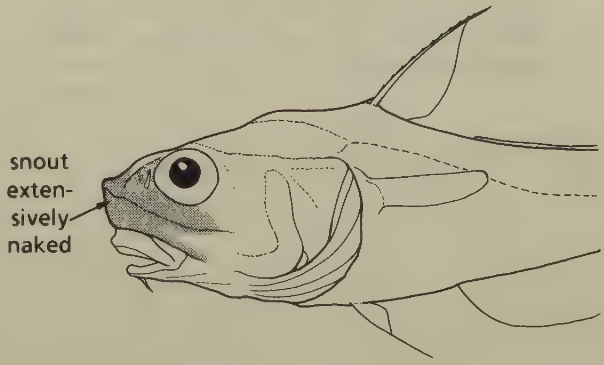
C. tydemani
(after Weber, 1913)

Fig. 453



C. semiscaber
(after Gilbert & Hubbs, 1920)

Fig. 454



C. oreinos
(after Iwamoto & Sazonov, 1988)

Fig. 455

54a. Body scales coarsely spinulated, adherent, those of suborbital shelf strongly adherent, in 2 or more rows forming a distinct scaled edge to ventral rim of orbits

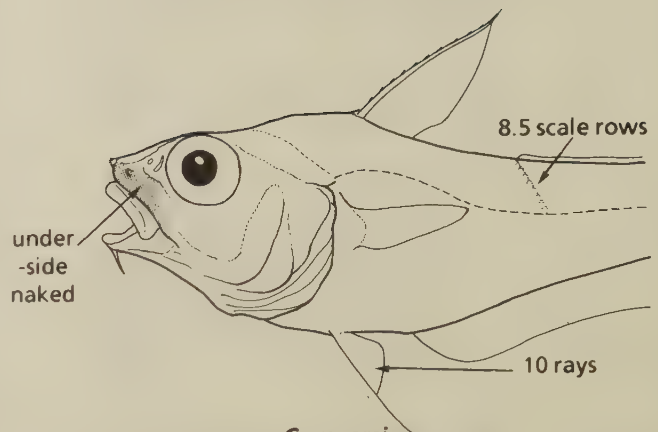
55a. Pelvic fin rays 10; scales below origin of second dorsal fin 8.5; pyloric caeca long, slender, about 7; snout very low, scarcely produced beyond mouth, preoral length only slightly longer than posterior nostril .... ***C. myersi*** (Fig. 456)

55b. Pelvic fin rays 7 or 8 (sometimes 9); scales below origin of second dorsal fin 4.5 to 7.5; pyloric caeca short to rudimentary stubs, 6 to 11; snout distinctly protruding beyond mouth; preoral length about twice or longer than posterior nostril

56a. Snout relatively long, strongly pointed, 31 to 34% of head length; interorbital space 21 to 26% of head length; orbits 25 to 30% of head length; pyloric caeca short, about 11 total; scales below origin of second dorsal fin 6.5 to 7.5; inner gill rakers on first arch 9 or 10 total .... ***C. guentheri*** (Fig. 457)

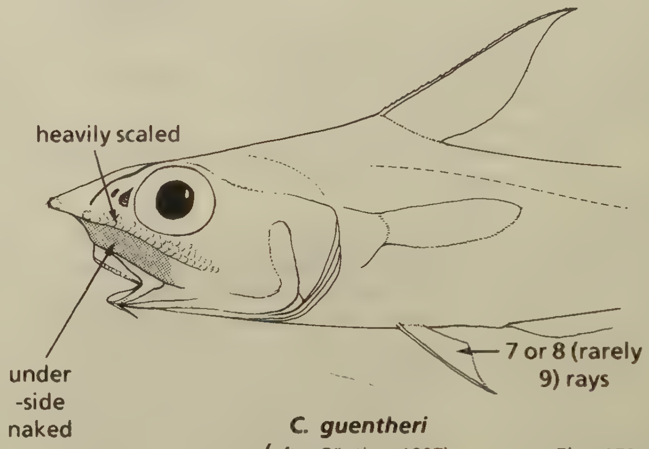
56b. Snout rather short, bluntly pointed, 24 to 27% of head length; interorbital space 14 to 17% of head length; orbit diameter 29 to 35% of head length; pyloric caeca rudimentary stubs, 6 or 7 total; scales below origin of second dorsal fin 4.5 to 6.5; inner gill rakers on first arch 10 to 12 total .... ***C. boops*** (Fig. 458)

54b. Body scales thin and highly deciduous or heavily spinulated and moderately adherent; suborbital shelf mostly naked or with small scales in 1 or 2 rows that do not cover most of shelf and do not form a scaled ventral orbital edge



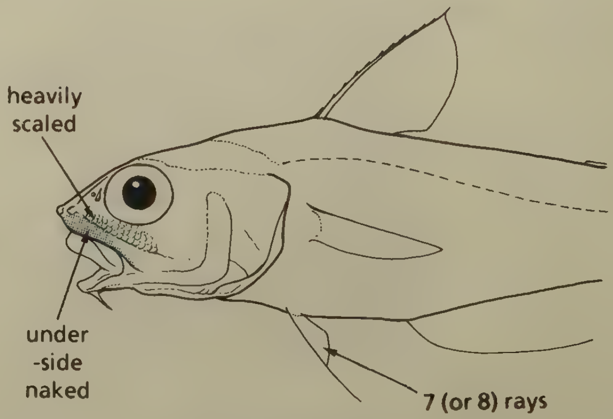
C. myersi
(after Iwamoto & Sazonov, 1988)

Fig. 456



C. guentheri
(after Günther, 1887)

Fig. 457



C. boops
(after Iwamoto & Sazonov, 1988)

Fig. 458

57a. Snout blunt, not much protruding beyond mouth, length 22 to 31% of head length; inner gill rakers on first arch 10 to 14 total; pyloric caeca short to long, 6 to 10

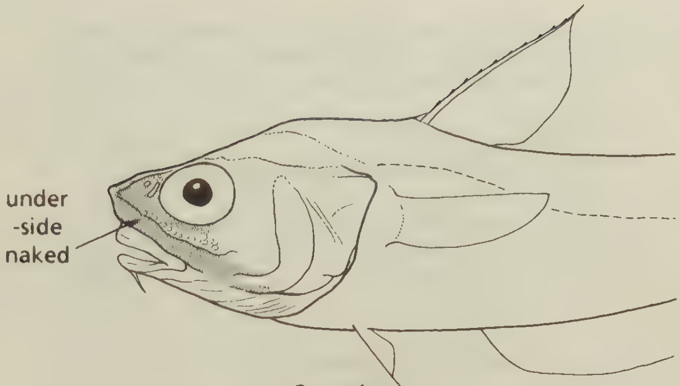
- **58a.** Inner gill rakers on first arch 11 to 14; interorbital space narrow, width 14 to 21% of head length; pyloric caeca short, 6 to 8 .... ***C. capito*** (Fig. 459)

- **58b.** Inner gill rakers on first arch 10 to 12; interorbital space 21 to 28% of head length; pyloric caeca long, 9 or 10 .... ***C. paramarshalli*** (Fig. 460)

57b. Snout pointed, protruding well beyond mouth, length 28 to 35% of head length; inner gill rakers on first arch 7 to 10; pyloric caeca long, 9 to 14

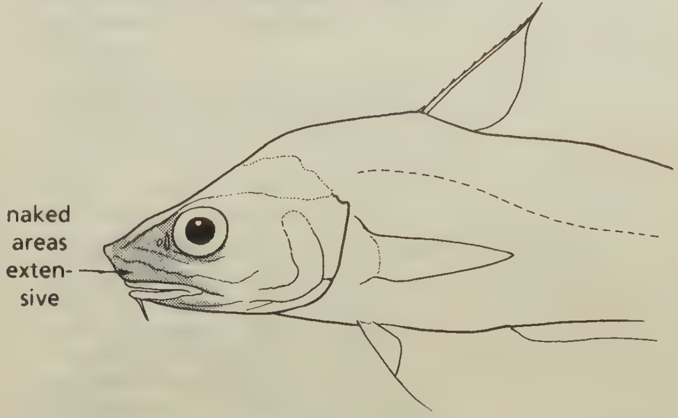
- **59a.** Pelvic fin with 9 rays (rarely 7, 8 or 10); scales relatively adherent, coarsely spinulated, 11 to 14 rows across interorbital space; dorsal rim of orbits demarcated by a row of small, coarse, adherent scales; orbit 1.09 to 1.66 times into distance from orbit to angle of preopercle ...... ***C. ariommus*** (Fig. 461)

- **59b.** Pelvic fin with 8 rays (rarely 7 or 9); scales highly deciduous, sparsely spinulated, 6 to 8 rows across interorbital space, no scales along dorsal rim of orbits; orbit 1.60 to 2.22 times the distance from orbit to angle of preopercle .... ***C. anguliceps*** (Fig. 462)


under
-side
naked

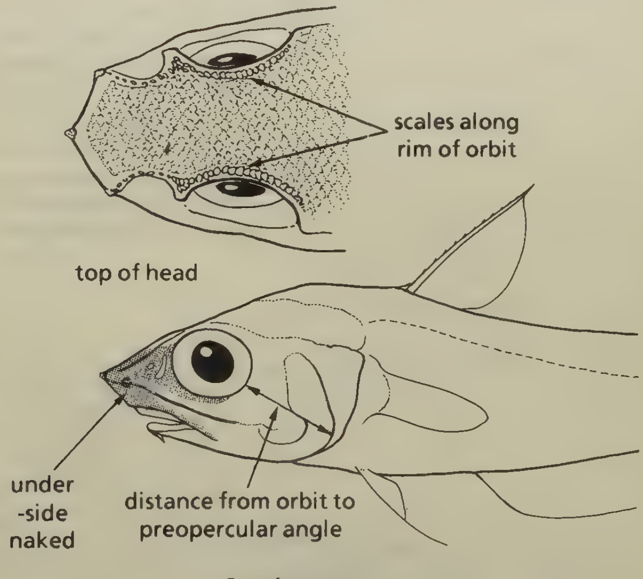
C. capito
(after Iwamoto & Sazonov, 1988)

Fig. 459


naked
areas
exten-
sive

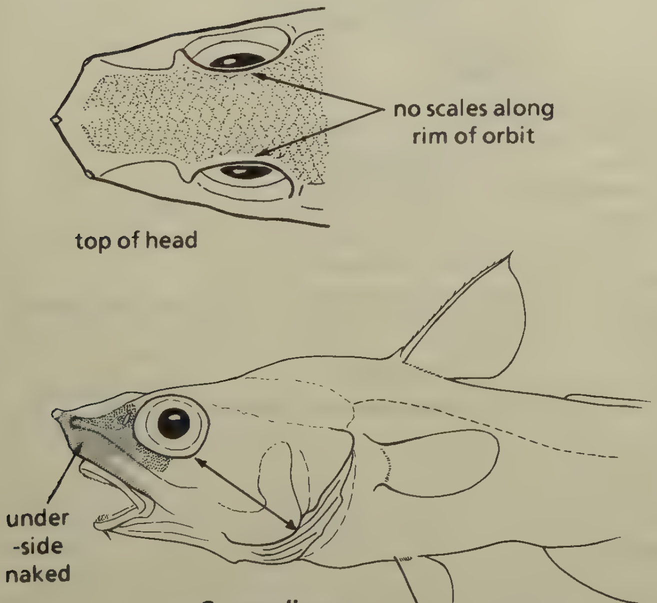
C. paramarshalli
(after Merrett, 1983)

Fig. 460


scales along
rim of orbit
top of head
under
-side
naked
distance from orbit to
preopercular angle

C. ariommus
(after Iwamoto & Sazonov, 1988)

Fig. 461

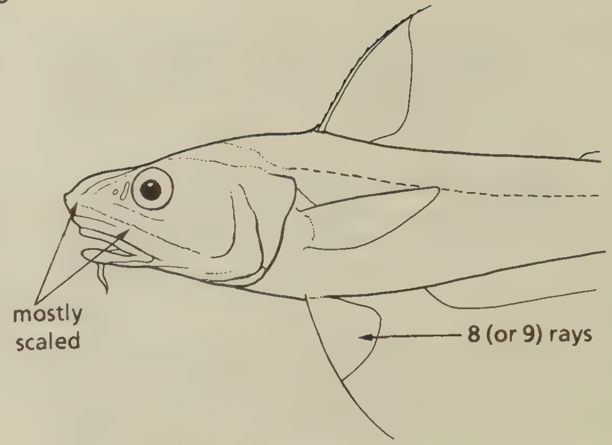

no scales along
rim of orbit
top of head
under
-side
naked

C. anguliceps
(after Iwamoto & Sazonov, 1988)

Fig. 462

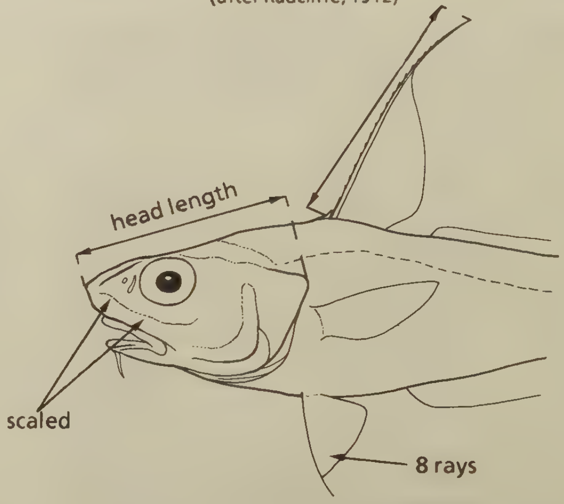
52b. Ventral surfaces of snout and suborbital space almost entirely scaled, except for a narrow to moderately broad naked strip midventrally on snout

- **60a.** Pelvic fin with 8 (rarely 9) rays
  - **61a.** Snout bluntly rounded; orbit diameter small, 20% of head length .... ***C. dubius*** (Fig. 463)
  - **61b.** Snout pointed; orbit diameter 23 to 31% of head length
    - **62a.** Spinous dorsal ray about equal to head length .... ***C. asprellus*** (Fig. 464)
    - **62b.** Spinous dorsal ray about equal to postrostral length of head
      - **63a.** Outer pelvic fin ray elongated, about equal to head length; barbel stout; pyloric caeca 8 or 9; mouth opening restricted posterolaterally, rictus extends about to below anterior nostril ..... ***C. carminifer*** (Fig. 465)
      - **63b.** Outer pelvic fin ray much less than head length; barbel slender; pyloric caeca 11 to 14; mouth opening relatively unrestricted, rictus extends to below anterior rim of orbits or beyond ... ***C. woodmasoni*** (Fig. 466)
- **60b.** Pelvic fin with 9 to 11 rays
  - **64a.** Pelvic fin with 10 or 11 rays


mostly scaled
8 (or 9) rays

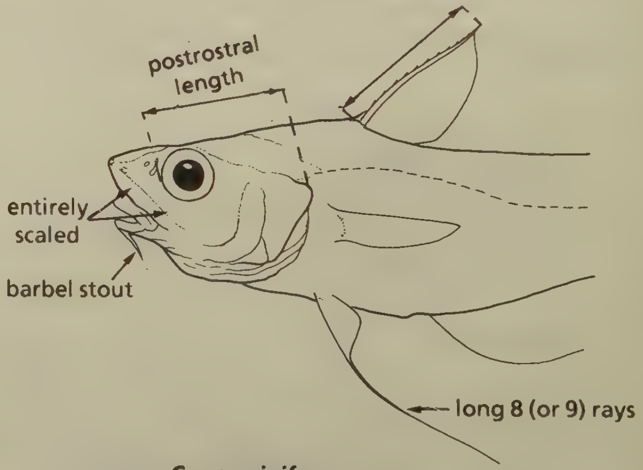
C. dubius
(after Radcliffe, 1912)

Fig. 463


head length
scaled
8 rays

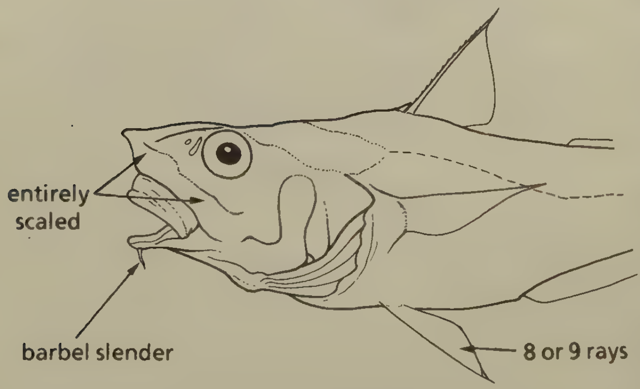
C. asprellus
(after Radcliffe, 1912)

Fig. 464


postrostral length
entirely scaled
barbel stout
long 8 (or 9) rays

C. carminifer
(after Iwamoto & Sazonov, 1988)

Fig. 465


entirely scaled
barbel slender
8 or 9 rays

C. woodmasoni
(after Alcock, 1899)

Fig. 466

65a. Interspace between dorsal fins about equal to length of first dorsal fin base; second dorsal fin origin above origin of anal fin; scale rows below origin of second dorsal fin 5 to 5.5 .... ***C. asper*** (Fig. 467)

65b. Interspace between dorsal fins much longer than base of first dorsal fin; second dorsal fin origin well behind anal fin origin; scales below origin of second dorsal fin 6 to 10

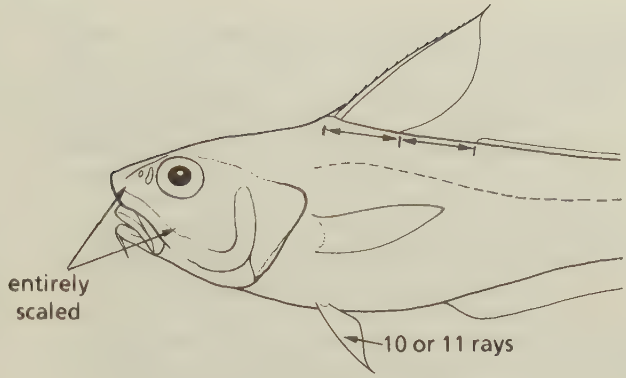
66a. Barbel stout, 11 to 18% of head length; snout blunt, scarcely projecting beyond mouth; inner gill rakers on first arch 11 or 12; interorbital space very narrow, 19 to 21% of head length .... ***C. zaniophorus*** (Fig. 468)

66b. Barbel slender, short, 5 to 9% of head length; snout bluntly to acutely pointed, projecting moderately beyond mouth; inner gill rakers on first arch 8 to 11; interorbital space 20 to 27% of head length

67a. Ventral surfaces of snout with a median ventral naked strip; inner gill rakers of first arch 9 to 11 (total); dorsal fin spine more than postrostral length of head .... ***C. nasutus*** (Fig. 469)

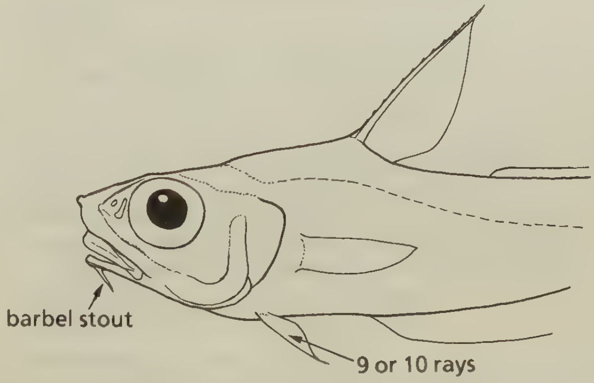
67b. Ventral surfaces of snout completely scaled; inner gill rakers on first arch 8 or 9 (total); dorsal fin spine much less than postrostral length of head ... ***C. mexicanus*** (Fig.448)

64b. Pelvic fin with 9 rays (sometimes 8 in *C. hoskynii*



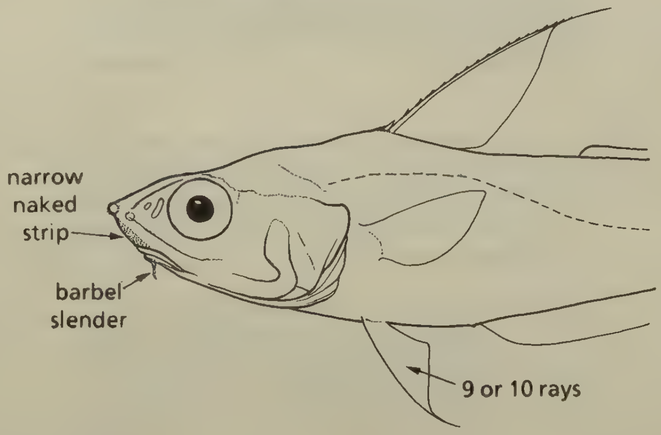
C. asper
(after Günther, 1887)

Fig. 467



C. zaniophorus
(after Iwamoto, 1970)

Fig. 468



C. nasutus
(after Günther, 1887)

Fig. 469

68a. Barbel moderate to long, 11 to 34% of head length

69a. Snout blunt, barely protruding beyond large mouth; upper jaw 40 to 45% of head length .... ***C. dubius*** (Fig. 463)

69b. Snout more pointed, protruding beyond small to moderate-sized mouth; upper jaw much less than 40% of head length

70a. Orbits rather large, 30 to 34% of head length; origin of pelvic fins forward of pectoral fin origins; length of outer pelvic ray much less than length of head .... ***C. zaniophorus*** (Fig.468)

70b. Orbits less than 30% of head length; pelvic fin origin below or behind pectoral fin origin; outer pelvic fin ray about equal to or greater than head length

71a. Mouth small, posterior extent of rictus below anterior nostril .... ***C. carminifer*** (Fig. 465)

71b. Mouth moderate, rictus extends to below anterior margin of orbit or beyond ... ***C. aequatoris*** (Fig. 470)

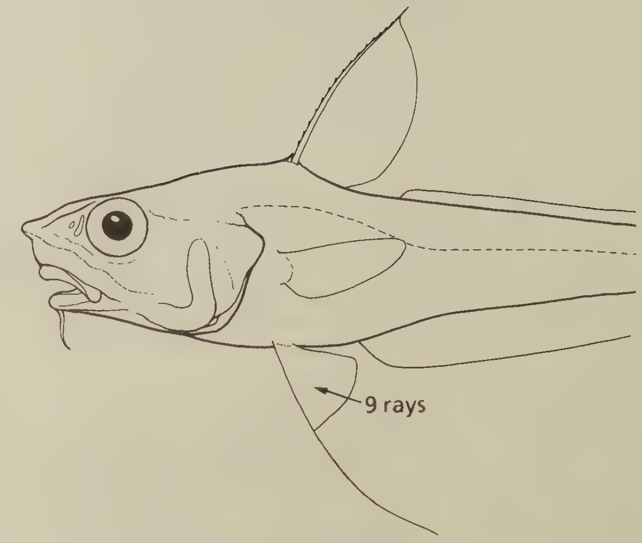
68b. Barbel short to rudimentary, less than 10% of head length

72a. Scale rows below origin of second dorsal fin about 5, body scales with spinules in parallel rows, the central longitudinal series slightly enlarged and projecting beyond scale margin (other spinules not projecting) .... ***C. hoskynii*** (Fig. 471)

72b. Scale rows below origin of second dorsal fin 6 to 8; body scales densely covered with slender spinules in irregular, somewhat quincunx arrangement, with no enlarged longitudinal series

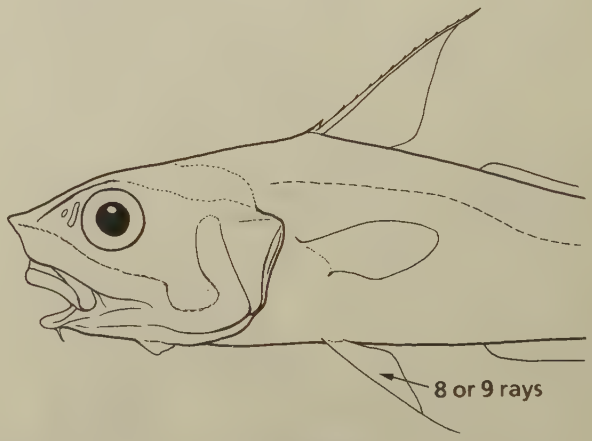
73a. Ventral surfaces of snout with a median ventral naked strip; inner gill rakers of first arch 9 to 11 (total); dorsal fin spine 0.8 to 1.3 times into postrostral length of head .... ***C. nasutus*** (Fig. 469)

73b. Ventral surfaces of snout completely scaled; inner gill rakers on first arch 8 to 9 (total); dorsal fin spine much less than postrostral length of head .... ***C. mexicanus*** (Fig.448)



C. aequatoris
(after Radcliffe, 1912)

Fig. 470



C. hoskynii
(after Alcock, 1899)

Fig. 471

List of *Coryphaenoides* Species

Subgenus ***Bogoslovius*** Jordan & Evermann, 1898

Coryphaenoides (B.) longifilis Günther, 1877

Subgenus ***Chalinura*** Good & Bean, 1883

Coryphaenoides (C.) brevibarbis (Goode & Bean, 1896)
Coryphaenoides (C.) fernandezianus (Günther, 1887)
Coryphaenoides (C.) leptolepis Günther, 1877
Coryphaenoides (C.) liocephalus (Günther, 1887)
Coryphaenoides (C.) mediterraneus (Giglioli, 1893)
Coryphaenoides (C.) murrayi Günther, 1878
Coryphaenoides (C.) profundicolus (Nybelin, 1957)
Coryphaenoides (C.) serrulatus Günther, 1878
Coryphaenoides (C.) striaturus Barnard, 1925
Coryphaenoides (C.) subserrulatus Makushok, 1976

Subgenus ***Coryphaenoides*** Gunnerus, 1765

Coryphaenoides (C.) acrolepis (Bean, 1884)
Coryphaenoides (C.) aequatoris (Smith & Radcliffe, 1912)
Coryphaenoides (C.) alateralis Marshall & Iwamoto, 1973
Coryphaenoides (C.) altipinnis Günther, 1877
Coryphaenoides (C.) anguliceps (Garman, 1899)
Coryphaenoides (C.) ariommus Gilbert & Thompson, 1916
Coryphaenoides (C.) asper Günther, 1877
Coryphaenoides (C.) asprellus (Smith & Radcliffe, 1912)
Coryphaenoides (C.) boops (Garman, 1899)
Coryphaenoides (C.) bucephalus (Garman, 1899)
Coryphaenoides (C.) bulbiceps (Garman, 1899)
Coryphaenoides (C.) camurus (Smith & Radcliffe, 1912)
Coryphaenoides (C.) capito (Garman, 1899)
Coryphaenoides (C.) carminifer (Garman, 1899)
Coryphaenoides (C.) cinereus (Gilbert, 1895)
Coryphaenoides (C.) delsolari Chirichigno & Iwamoto, 1977
Coryphaenoides (C.) dubius (Smith & Radcliffe, 1912)
Coryphaenoides (C.) filamentosus Okamura, 1970
Coryphaenoides (C.) filifer (Gilbert, 1895)
Coryphaenoides (C.) guentheri (Vaillant, 1888)
Coryphaenoides (C.) hextii (Alcock, 1890)
Coryphaenoides (C.) hoskynii (Alcock, 1890)
Coryphaenoides (C.) longicirrhus Gilbert, 1905
Coryphaenoides (C.) macrocephalus (Maul, 1951)
Coryphaenoides (C.) macrolophus (Alcock, 1889)
Coryphaenoides (C.) marginatus Steindachner & Döderlein, 1887
Coryphaenoides (C.) marshalli Iwamoto, 1970
Coryphaenoides (C.) mexicanus (Parr, 1946)
Coryphaenoides (C.) microps (Smith & Radcliffe, 1912)
Coryphaenoides (C.) myersi Iwamoto & Sazonov, 1988
Coryphaenoides (C.) nasutus Günther, 1877
Coryphaenoides (C.) oreinos Iwamoto & Sazonov, 1988
Coryphaenoides (C.) orthogrammus (Smith & Radcliffe, 1912)
Coryphaenoides (C.) paradoxus (Smith & Radcliffe, 1912)
Coryphaenoides (C.) paramarshalli Merrett, 1983
Coryphaenoides (C.) rudis Günther, 1878
Coryphaenoides (C.) rupestris Gunnerus, 1765
Coryphaenoides (C.) semiscaber Gilbert & Hubbs, 1920
Coryphaenoides (C.) sibogae Weber & de Beaufort, 1929
Coryphaenoides (C.) thelestomus Maul, 1951
Coryphaenoides (C.) tydemani (Weber, 1913)
Coryphaenoides (C.) woodmasoni Alcock, 1890
Coryphaenoides (C.) zaniophorus (Vaillant, 1888)

Subgenus ***Lionurus*** Günther, 1887

Coryphaenoides (L.) carapinus (Goode & Bean, 1883)
Coryphaenoides (L.) filicaudus Günther, 1887

Subgenus ***Nematonurus*** Günther, 1887

Coryphaenoides (N.) affinis (Günther, 1878)
Coryphaenoides (N.) armatus (Hector, 1875)
Coryphaenoides (N.) ferrieri (Regan, 1913)
Coryphaenoides (N.) lecointei (Dollo, 1900)
Coryphaenoides (N.) yaquinae Iwamoto & Stein, 1974

Note The species described below do not take account of the subgenera. They appear in alphabetical order by species name only

Coryphaenoides acrolepis (Bean, 1884)

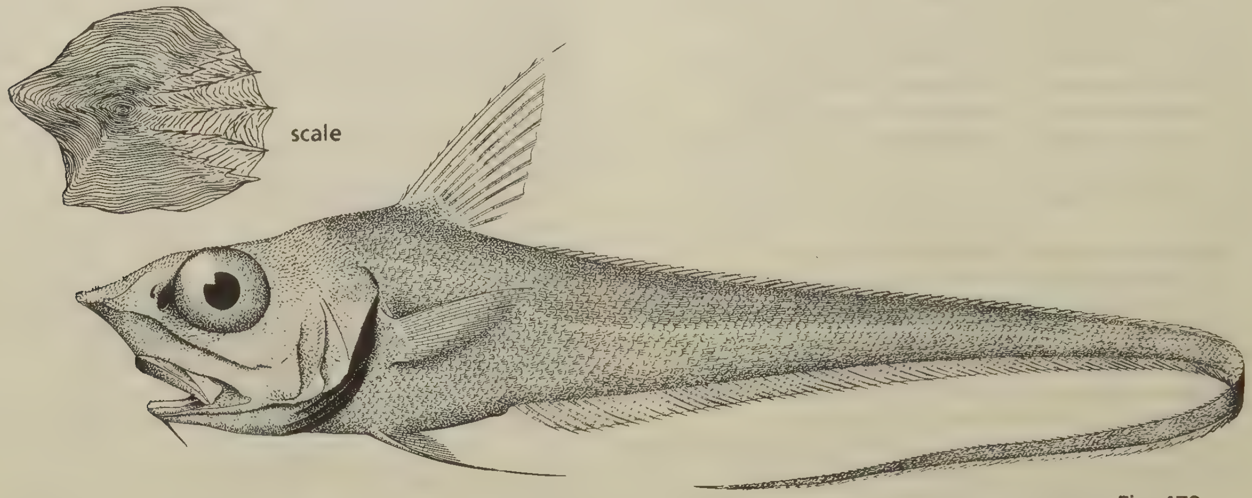
Fig. 472

MACROUR Cory 1

Scientific Name with Reference : ***Macrurus acrolepis*** Bean, 1884, Proc.U.S.Natl.Mus. (1883)6:362-3 (off Washington, USA).

Synonyms : ***Macrurus firmisquamis*** Gill & Townsend, 1897; ***Bogoslovius firmisquamis*** -- Jordan & Evermann, 1898; ***Coryphaenoides bona-nox*** Jordan & Thompson, 1914; ***Hemimacrurus acrolepis*** -- Fraser-Brunner, 1935; ***Coryphaenoides acrolepis*** -- Gilbert & Hubbs, 1916; ***Nematonurus acrolepis*** -- Okada & Matsubara, 1938.

FAO Names : **En** - Pacific grenadier.



(from files of USNM)

Fig. 472

Diagnostic Features : A large species of the subgenus ***Coryphaenoides***, with a prominent snout armed with stout tubercular scales along leading edge; a small chin barbel; teeth in two irregular rows or in a narrow band in both jaws, those in lower somewhat smaller than those in upper jaw. Inner gillrakers on first arch 11 to 13 (total). Measurements in percentage of head length: snout length 25 to 30, orbit diameter 24 to 31, interorbital space 18 to 24; upper jaw 36 to 44; barbel length 11 to 19; isthmus to anal fin origin 82 to 100. Interspace between first and second dorsal fins 8 to 15. First dorsal fin with 2 spines and 9 to 11 rays; pelvic fin rays 8 (rarely 9); outer pelvic fin ray relatively short, 50 to 70% of head length. Scales adherent, covered with coarse spinules in 3 to 5 divergent rows; head scaled completely except for a narrow ventro-median strip on snout, ventral edges of snout and suborbital space; scales below middle of first dorsal fin base 7 to 9 (rarely 10). Pyloric caeca 12 to 14. **Colour:** overall grey to greyish-brown in young, turning to dark brown or blackish in adults; fins generally dark.

Geographical Distribution : North Pacific from northern Japan to Okhotsk and Bering seas, south along North American coasts to northern Mexico (Fig. 473).

Habitat and Biology : A benthopelagic mid- slope species, primarily in bottom depths from 600 to 2 500 m depth (temperatures 1° to 4°C). Appears to wander off slope bottom into midwaters of appropriate depths, as it is sometimes taken bathypelagically, and individuals often contain pelagic food items. Feeds on small fish, euphausids, prawns, amphipods and cephalopods.

Size : To more than 87 cm total length.

Interest to Fisheries : This large species is one of the most common grenadier in the North Pacific and sometimes taken by commercial trawlers fishing for Dover sole on the United States west coast. It is occasionally landed in United States west coast and Japan as incidental catch from longline fisheries. The Japan/US joint longline survey reported

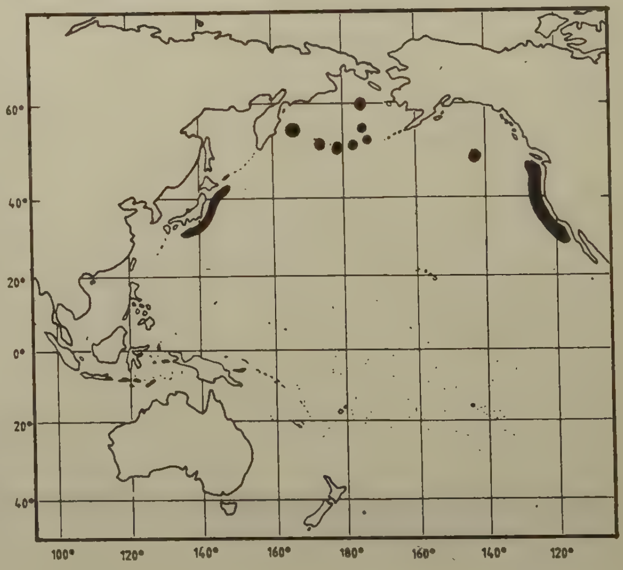


Fig. 473

that the average density of this species in 1985 and 1986 was fairly low in comparison with levels in previous years, and catch rates during the surveys decreased by 13% from 1985 to 1986. Sold in the United States as fresh filets. Considered to be a foodfish of high quality in Japan.

Local Names : CANADA: Rough-scaled grenadier; JAPAN: Ibarahige; USA: Pacific grenadier.

Literature : Clemens & Wilby (1961); Okamura (1970); Hart (1973); Pearcy & Ambler (1974); Iwamoto & Stein (1974); Int. North Pacif Fish Comm (1987)

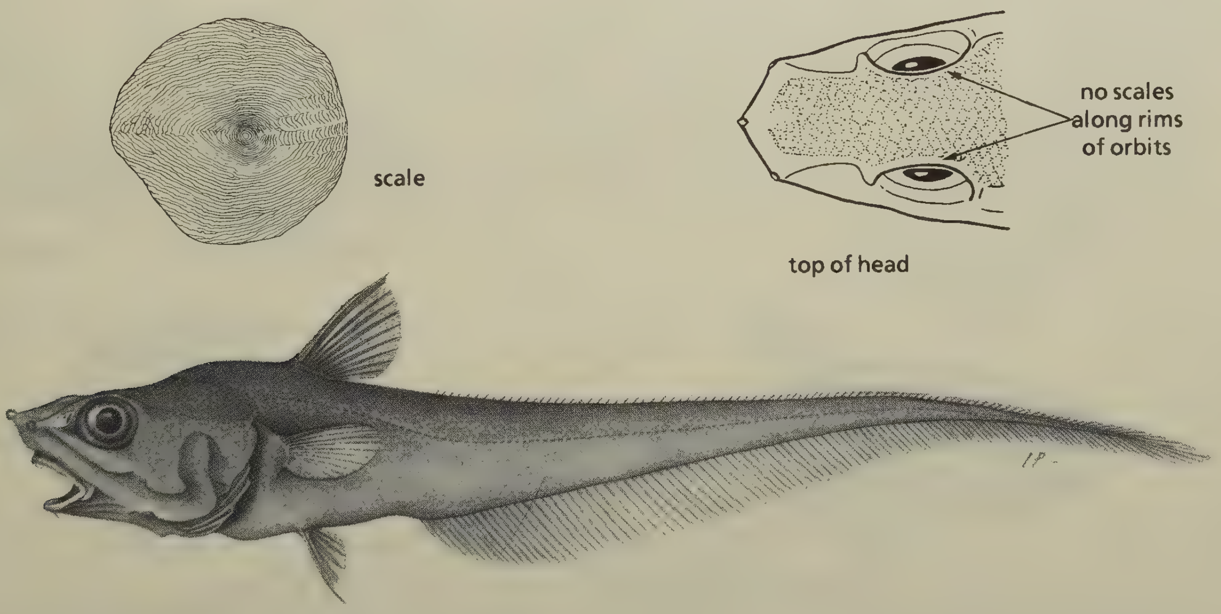
Remarks : Readily distinguished from its close relative ***C. filifer*** (Gilbert, 1895) by its fewer pelvic fin rays (8 against 10 or 11 in ***C. filifer***) and segmented dorsal fin rays; (9 to 11 against usually 12 or 13 in ***C. filifer***), the less elongated fin rays, the more adherent scales with stouter spinules, and an entirely black orbital rim.

Coryphaenoides anguliceps (Garman, 1899) Fig. 474 MACROUR Cory 2

Scientific Name with Reference : ***Macrurus anguliceps*** Garman, 1899, Mem.Mus.Comp.Zool.Harvard, 24:212, pl. G, fig.1; pl.83, fig.2 (Cocos Ridge between Panama and Galapagos; 5°56'N, 85°10.5'W; 2149 m)..

Synonyms : ***Coryphaenoides anguliceps***--Gilbert & Hubbs, 1916; ***Macrurus liraticeps*** Garman, 1899; ***Coryphaenoides liraticeps***--Gilbert & Hubbs, 1916; ***Macrurus latinasutus*** Garman, 1899; ***Coryphaenoides latinasutus***--Gilbert & Hubbs, 1916; ***Lionurus latinasutus***--Marshall, 1973.

FAO Names : **En** - Loosescale grenadier.



(adapted from Iwamoto & Sazonov, 1988)

Fig. 474

Diagnostic Features : Snout prominent and pointed, chin barbel tiny; small teeth in bands in both jaws; inner gill rakers of second arch 7 to 9 (total). Measurements in percentage of head length: snout length 28 to 34; orbit diameter 21 to 29; interorbital space 17 to 24; upper jaw 27 to 35; barbel 3 to 9. First dorsal fin with 2 spines and 8 to 10 rays; pelvic fin with 8 (rarely 7 or 9) rays. Scales highly deciduous; ventral and leading surfaces of snout naked; suborbital region dorsally mostly naked; suborbital ridge scales small if present; head ridges without enlarged scute-like scales; transverse scale rows across interorbital space 6 to 8; scales below midbase of first dorsal fin 3.5 to 5.5. **Colour:** overall grey brown to dark brown (descaled areas whitish); oral cavity pale to greyish.

Geographical Distribution : Gulf of California to northern Peru and Galapagos (Fig. 475).

Habitat and Biology : A deep-slope species of the tropical eastern Pacific. Benthopelagic in depths from 722 to 2 418 m depth.

Size : To more than 50 cm total length.

Interest to Fisheries : A rather common species where found, but of no current commercial interest.

Literature : Garman (1899); Iwamoto & Sazonov (1988).

Remarks : Serrations on the leading edge of the second spinous dorsal ray and spinulation on scales become reduced in large individuals. This species is most likely to be confused with *C.* ***ariommus***, a more southerly species whose range overlaps in northern Peru. The two can be distinguished by the number of transverse scale rows across the interorbital space (11 to 14 in *C.* ***ariommus***), the absence of ridge scales over the orbits in *C.* ***anguliceps***, the darker oral cavity and generally more pelvic rays in *C.* ***ariommus*** (9).

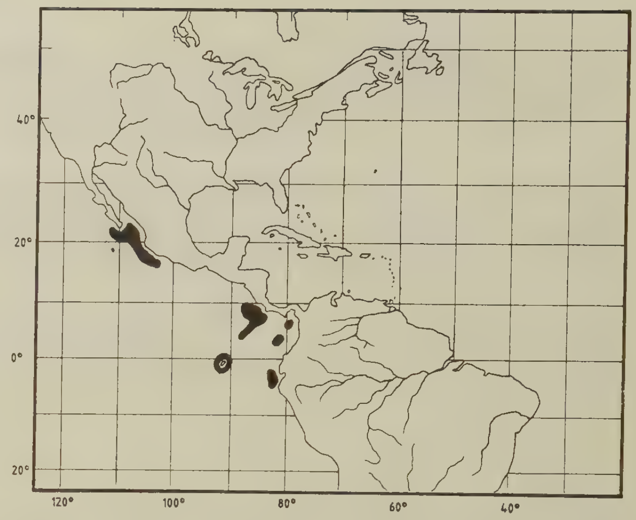


Fig. 475

Coryphaenoides ariommus Gilbert & Thompson, 1916

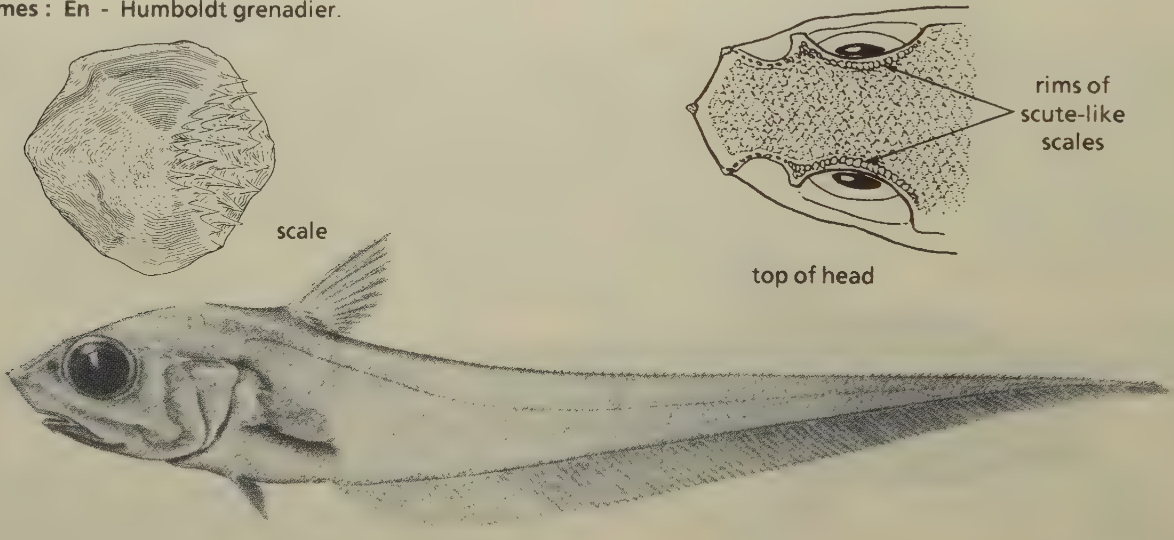
Fig. 476

MACROUR Cory 3

Scientific Name with Reference : ***Coryphaenoides ariommus*** Gilbert & Thompson, in Thompson, 1916, Proc.U.S.Natl.Mus., 50:401, pl.5, fig.1 (off Lota, Chile; 38°08'S, 75°53'W; in 1238 m).

Synonyms : None

FAO Names : En - Humboldt grenadier.



(from Iwamoto& Sazonov, 1988)

Fig. 476

Diagnostic Features : Snout moderately pointed, chin barbel tiny; small teeth in bands in both jaws; gill rakers in second arch 7 to 10 (total). Measurements in percentage of head length: snout 28 to 35; orbit diameter 25 to 36; interorbital space 20 to 29; upper jaw 25 to 31; barbel 4 to 9. First dorsal fin with 2 spines and 8 or 9 rays (rarely 7 or 10); pelvic fin rays 9 (rarely 8 to 10). Scales moderately adherent; underside and leading margin of snout naked except for scutes at tip and lateral angles; a file of small embedded scales along suborbital space, but region dorsally mostly naked; small but coarse scutelike scales on head ridges; transverse scale rows across interorbital space 11 to 14. Spinules on body scales short, conical in young, more triangular and flattened in adults, arranged in parallel to divergent longitudinal rows; scales below midbase of first dorsal fin 4.5 to 6.5. **Colour:** overall light to medium brown; lips and barbel dark brown; oral cavity blackish.

Geographical Distribution : Northern Peru to southern Chile (38°S) (Fig. 477).

Habitat and Biology : A middle slope species of the temperate southeastern Pacific in depths from 768 to 1860 m.

Size : To at least 46 cm total length.

Interest to Fisheries : Species may be locally abundant, judged from catches of oceanographic research vessels, but probably of little or no commercial value.

Literature : Gilbert & Thompson (1916); Pequeño (1971): Iwamoto & Sazonov (1988).

Remarks : This species is most likely to be confused with ***C. anguliceps***, but the more numerous and more adherent scales across the interorbital space, the scutelike ridge scales on the dorsal orbital margins, the darker oral cavity and generally more pelvic rays in ***C. ariommus*** (9) are distinguishing.

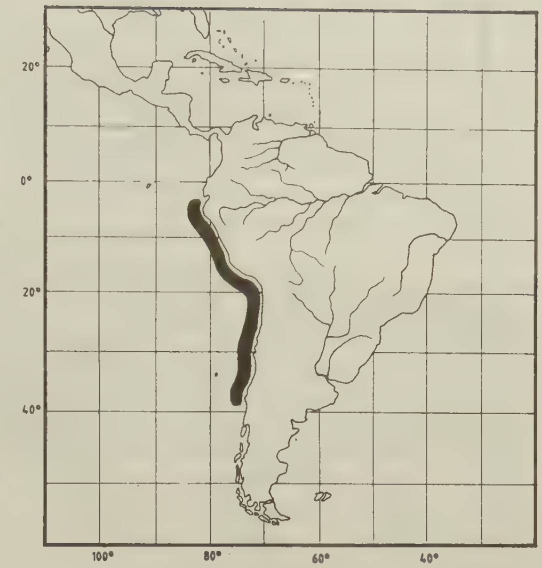


Fig. 477

Coryphaenoides armatus (Hector, 1875)

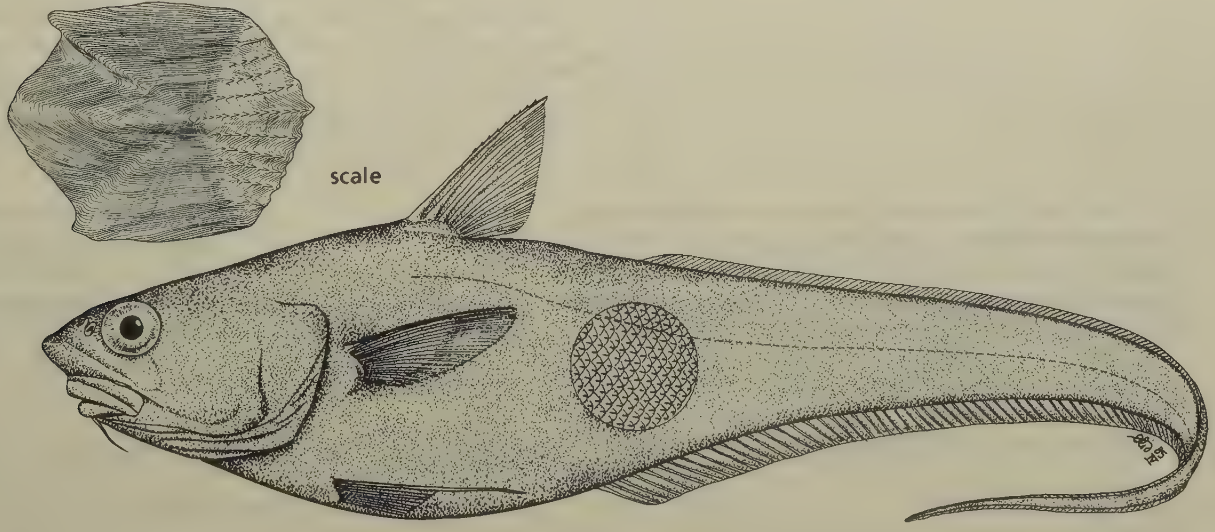
Fig. 478

MACROUR Cory 4

Scientific Name with Reference : ***Macrurus armatus*** Hector, 1875, Ann.Mag.Nat.Hist., ser.4, 15:81 (off Cape Farewell, New Zealand; 732 m).

Synonyms : ***Coryphaenoides variabilis*** Günther, 1878; ***Macrurus asper*** Goode & Bean, 1883; ***Macrurus goodii*** Günther, 1887; ***Macrurus (Nematonurus) armatus***--Günther, 1887; ***Coryphaenoides gigas*** Vaillant, 1888; ***Macrurus cyclolepis*** Gilbert, 1895; ***Hymenocephalus goodei***--Goode & Bean, 1896; ***Nematonurus armatus***--Goode & Bean, 1896; ***Nematonurus gigas***--Goode & Bean, 1896; ***Macrurus (Nematonurus) suborbitalis*** Gill & Townsend, 1897; ***Macrurus (Hymenocephalus) goodei***--Lütken, 1898; ***Moseleya cyclolepis***--Jordan & Evermann, 1898; ***Nematonurus goodei***--Jordan & Evermann, 1898; ***Nematonurus suborbitalis***--Jordan & Evermann, 1898; ***Nematonurus abyssorum*** Gilbert, 1915; ***Coryphaenoides (Nematonurus) armatus***--Gilbert & Hubbs, 1916; ***Dolloa cyclolepis***--Jordan, Evermann & Clark, 1930; ***Coryphaenoides abyssorum***--Barnhart, 1936; ***Coryphaenoides cyclolepis***--Clemens & Wilby, 1961.

FAO Names : En - Abyssal grenadier.



(after Günther, 1887)

Fig. 478

Diagnostic Features : Ventral aspects of head mostly naked, including snout, most ventral surfaces of suborbital space, ventral preopercular margin and anterior part of mandible; premaxillary teeth stoutly conical, the tips somewhat spatulate, in 1 (large adults) or 2 distinct rows; in 1 row on mandible; inner gill rakers on first arch 11 to 14. Measurements in percentage of head length; snout 20 to 31; preoral length 6 to 17; orbit diameter 18 to 27; interorbital space 21 to 26; orbit to angle of preopercle 35 to 49; suborbital width 9 to 13; upper jaw 34 to 40; barbel 11 to 19. First dorsal fin with 2 spines and 8 to 10 rays, pectoral fin rays i17 to i21; pelvic fin rays usually 10 in Atlantic, and usually 11 or 12 in Pacific specimens. Body scales rather thin and deciduous, finely covered with parallel rows of thin, sharp spinules, the median row slightly larger than adjacent rows; scales over suborbital shelf small, about 4 rows wide; no enlarged snout scutes; scale rows below midbase of first dorsal fin 6 to 8.

Geographical Distribution : Worldwide (Fig. 479).

Habitat and Biology : A deep-slope, upper continental rise species, common in deep waters of most oceans between approximately 2000 and 4700 m depth, beyond which it is replaced by ***C. yaquinae***. In the Pacific, it is apparently confined to the Pacific rim. Feeds on a variety of benthic invertebrates (especially crustaceans and holothuroids) when young, switching to primarily mesopelagic and bathypelagic fish, and sea urchins and cephalopods as adults.

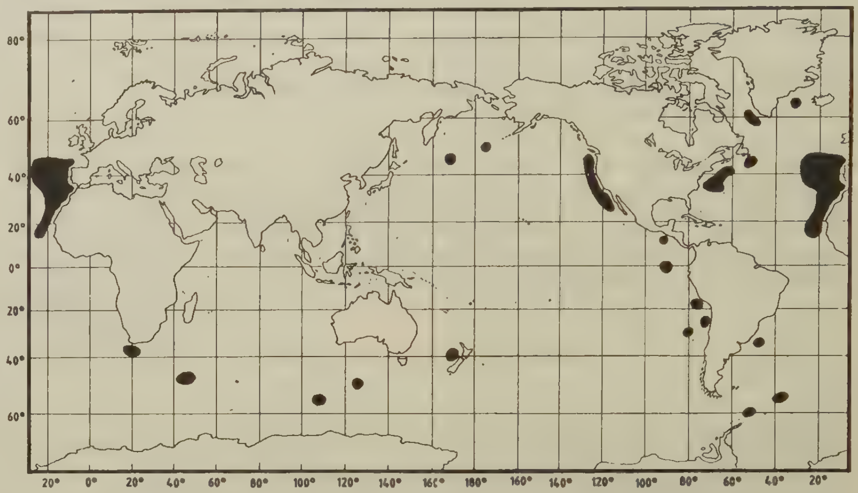


Fig. 479

Size : To 102 cm total length.

Interest to Fisheries : The species is large and taken in moderate numbers by oceanographic research vessels, but lives at depths too great to be of commercial potential.

Local Names : USA: Abyssal macrourid; USSR: Dolgokhvost vooruzhennyi.

Literature : Günther (1887); Parr (1946); Grey (1956); Nybelin (1957); Pearcy & Ambler (1974); Haedrich & Henderson (1974); Iwamoto & Stein (1974); Wilson & Waples (1983, 1984); Wilson & Smith (1984).

Remarks : ***Coryphaenoides armatus*** is most likely to be confused with ***C. yaquinae***, but its squamation and dentition are distinguishing. Wilson & Waples (1984) recognize two subspecies, ***C. armatus variablis*** from the North Pacific and ***C. armatus armatus*** from everywhere else.

Coryphaenoides carminifer (Garman, 1899)

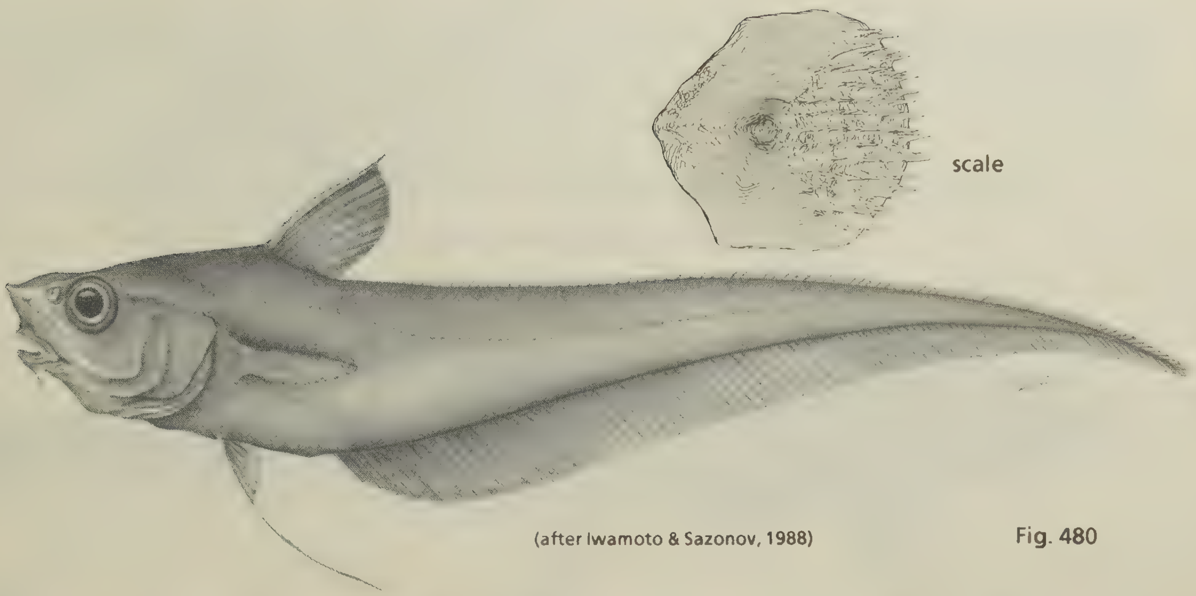
Fig. 480

MACROUR Cory 5

Scientific Name with Reference : ***Macrurus carminifer*** Garman, 1899, Mem.Mus.Comp.Zool.Harvard, 24:204-6, pl.46, fig.2 (Gulf of Panama; 7°15'N, 79°36'W; 1865 m).

Synonyms : ***Coryphaenoides carminatus*** -- Gilbert & Hubbs, 1916:144 (misspelling of specific name).

FAO Names : En - Carmine grenadier; **Fr** - Grenadier carmin; **Sp** - Granadero carminífero.



(after Iwamoto & Sazonov, 1988)

Fig. 480

Diagnostic Features : Snout short, bluntly pointed; chin barbel thick; small teeth in narrow bands in both jaws; inner gill rakers on first arch 8 to 10 (total), outer gill rakers on second arch 8 to 10 (total). Measurements in percentage of head length: snout length 26 to 31; orbit diameter 26 to 31; interorbital space 26 to 31; upper jaw 27 to 32; barbel 14 to 23. First dorsal fin with 2 spines and 8 to 10 rays; pectoral fin rays i16 to i22; pelvic fin rays 8 or 9. Scales adherent; head uniformly and completely scaled, stout scutes at tip and lateral angles of snout; spike-like spinules on body scales in parallel rows; scales below midbase of first dorsal fin 5.5 to 8.5.

Geographical Distribution : Gulf of Panama to Ecuador (Fig. 481).

Habitat and Biology : An uncommon slope species with a restricted range in the tropical eastern Pacific in depths from 589 to 1865 m.

Size : To at least 36 cm total length.

Interest to Fisheries : None at present.

Literature : Garman (1899); Iwamoto & Sazonov (1988).

Remarks : The notably thick barbel and complete head squamation immediately distinguish ***C. carminifer*** from other eastern Pacific members of the genus. It shares these features with ***C. zaniophorus*** Vaillant, 1888, from the Atlantic, but differs from that species in having a smaller orbit diameter and a broader interorbital space.

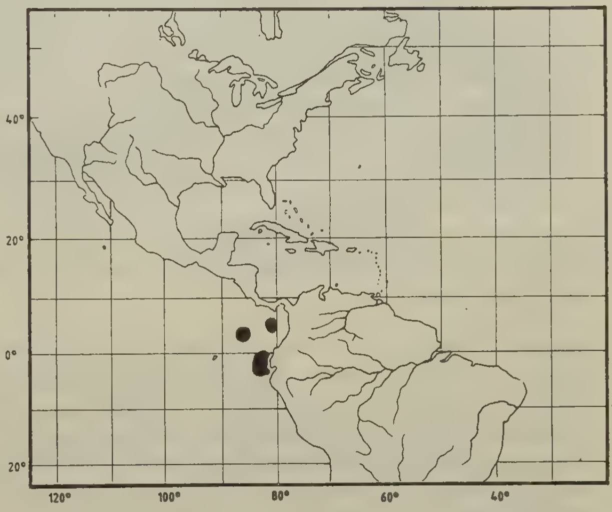


Fig. 481

Coryphaenoides cinereus (Gilbert, 1895)

Fig. 482

MACROUR Cory 6

Scientific Name with Reference : ***Macrurus cinereus*** Gilbert, 1895, Rep.U.S.Comm.Fish Fish. (1893)19:457 (Bering Sea).

Synonyms : ***Macrourus cinereus*** Gilbert, 1895; ***Coryphaenoides cinereus*** Gilbert & Hubbs, 1916.

FAO Names : En - Popeye grenadier.

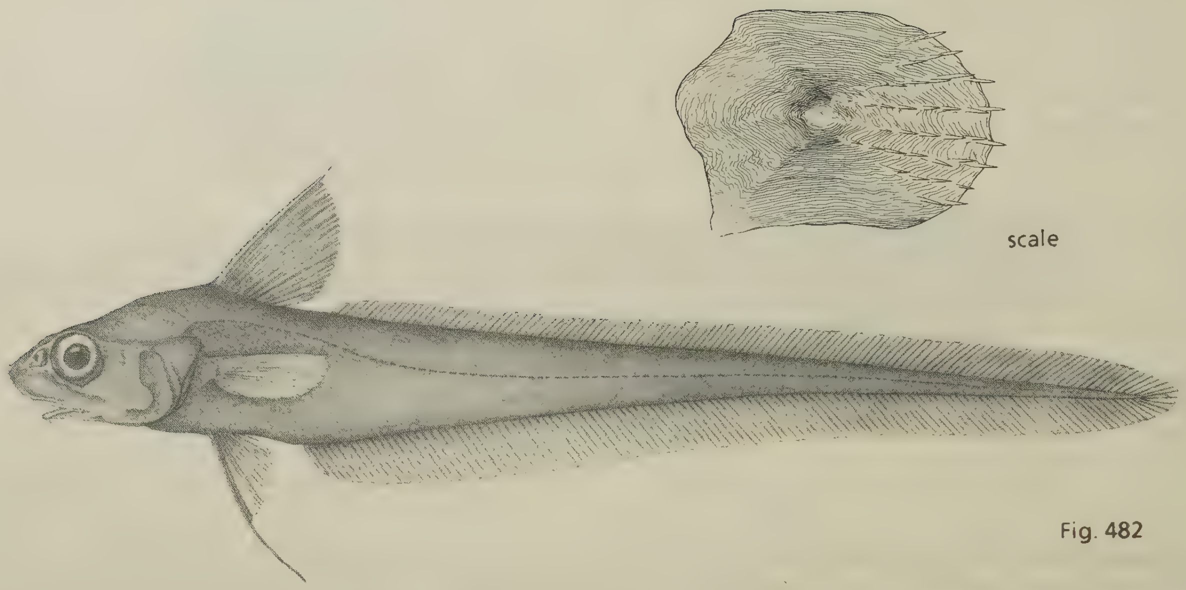


Fig. 482

Diagnostic Features : A medium-sized species, usually less than 45 cm. Snout tipped with a broad spinous scute; suborbital shelf very narrow anteriorly; interopercle broadly rounded posteriorly; chin barbel very short; teeth small, fine, in narrow bands in both jaws; inner gill rakers on second arch 1 or 2 + 10 to 13 (total 12 to 14). Measurements in percentage of head length: snout 25 to 29; orbit diameter 26 to 34; interorbital space 24 to 30; upper jaw 35 to 38; barbel 2 to 8; interspace between first and second dorsal fins about 15 to 22. Fins moderately large; height of first dorsal fin 85 to 105% of head length; pelvic fins usually 67 to 141% of head length (longer in males); first dorsal fin with 2 spines and usually 10 to 12 rays; pectoral fin rays usually i18 to i22; pelvic fin rays 8 to 10 (usually 9). Scales rather deciduous; spinules on body scales in 3 to 10 low, fine, subparallel, ridgelike rows; leading edge and most of underside of snout naked; gill and gular membranes and interopercle naked; no enlarged, stout, deeply embedded scales along suborbital region; grooved scales of lateral line discontinuous; scales below midbase of first dorsal fin about 8. Pyloric caeca short, 5 to 7. **Colour**: greyish brown (whitish denuded); fins blackish to dusky; mouth and gill cavities blackish.

Geographical Distribution : North Pacific from northern Japan to Okhotsk Sea, Bering Sea and south to Oregon (USA) (Fig. 483).

Habitat and Biology : Benthopelagic in 225 to 2832 m depth, but most common in 400 to 950 m in the Bering Sea, 720 to 1860 m (0°to 3°C) off Japan. Feeds primarily on pelagic forms.

Size : To 56 cm total length.

Interest to Fisheries : Taken in moderate quantities in the Bering Sea in 600 to 900 m depth. Species apparently too small for fresh consumption, used mostly for fishmeal.

Local Names : JAPAN: Karafutosokodara; USA: Ghost rattail, Popeye grenadier.

Literature : Birshteyn & Vinogradov (1955); Okamura (1970a); Iwamoto & Stein (1974); Sawada in Amaoka et al. (1983); Allen & Smith (1988).

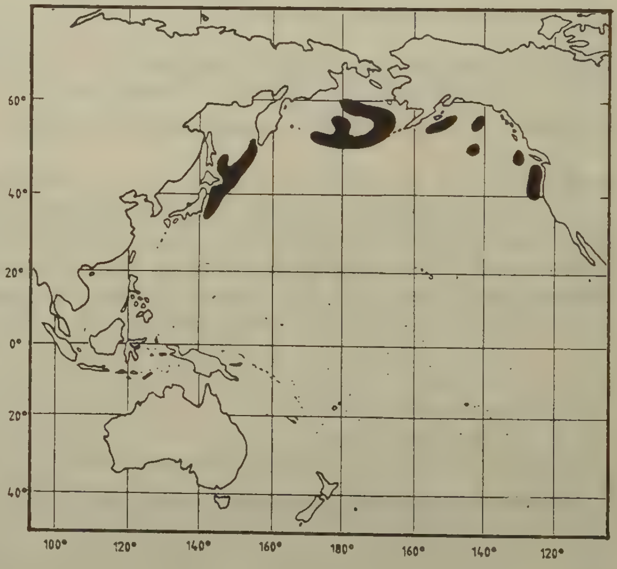


Fig. 483

Remarks : Considerable geographic variation in counts and morphometry have been noted in this species. The length of the outer pelvic ray is sexually dimorphic, the rays of the males being longer than those of comparable-sized females.

Coryphaenoides delsolari Chirichigno & Iwamoto, 1977

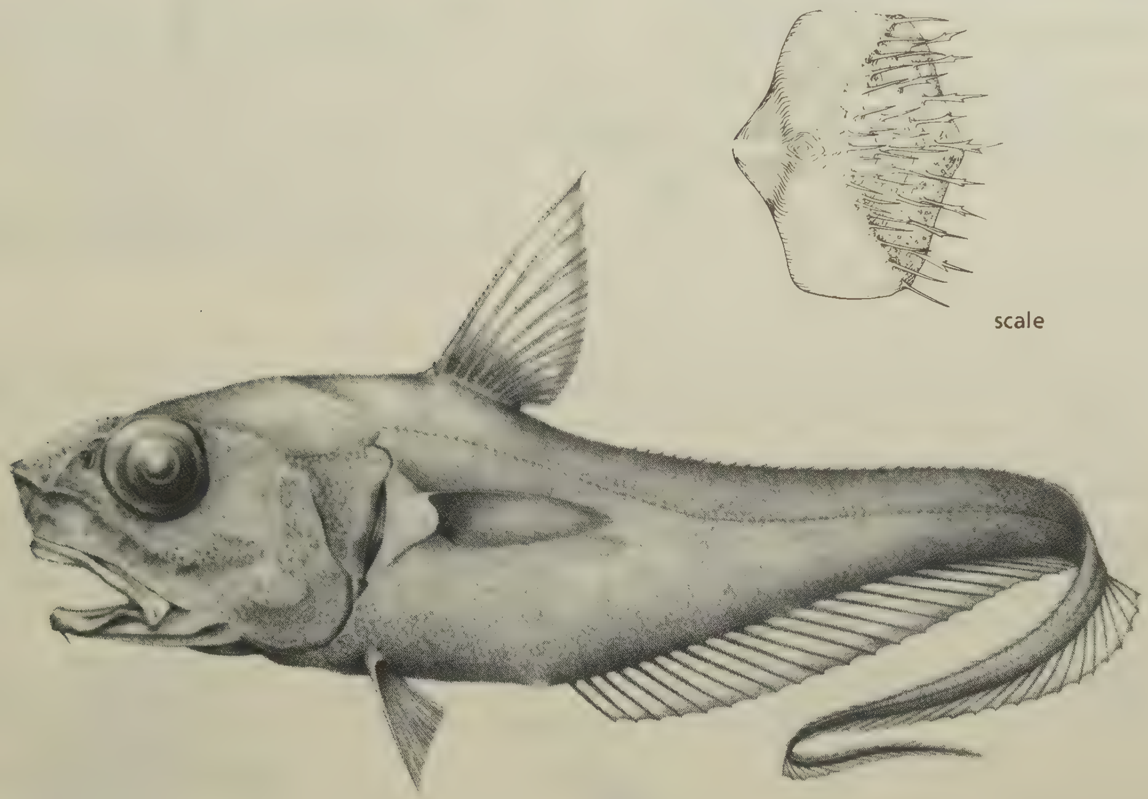
Fig. 484

MACROUR Cory 7

Scientific Name with Reference : ***Coryphaenoides delsolari*** Chirichigno & Iwamoto, 1977, Proc.Biol.Soc.Wash., 89(45):519 (off Gulf of Guayaquil, Ecuador; 3°15'S, 80°55'W; 945 to 960 m).

Synonyms : ***Nematonurus*** sp. aff. ***altipinnis***--Chirichigno, 1968; ***Coryphaenoides*** nov.sp.--Chirichigno, 1974.

FAO Names : En - Trident grenadier; **Fr** - Grenadier pichirat; **Sp** - Granadero pichirata.



(from Chirichigno & Iwamoto, 1977)

Fig. 484

Diagnostic Features : A medium-sized species. Snout bluntly pointed, terminal and lateral angles tipped with stout scutes; chin barbel small, more than 4 times into orbit diameter; teeth small, in broad bands in upper jaw, outer series slightly enlarged, in narrow band in lower jaw; inner gill rakers on second arch 1 or 2 + 9 to 12 (total 11 to 14). Measurements in percentages of head length: snout length 26 to 32, orbit diameter 23 to 34; interorbital space 23 to 32; suborbital width 12 to 17; upper jaw 35 to 41; outer gill slit 11 to 17; barbel 3 to 10; isthmus to anal fin origin 60 to 91; interspace between first and second dorsal fins 13 to 45. Fins not especially prolonged. First dorsal fin with 2 spines and 8 to 10 rays; pectoral fin rays i18 to i23 (usually i20 to i22); pelvic fin rays 9 or 10; outer pelvic ray extends slightly beyond anal fin origin. Scales densely covered with slender, relatively erect spinules in quincunx pattern or in slightly divergent rows; most spinules in adults (greater than 50 mm head length) with tridentate tips; almost all head and body scaled, including undersurface of snout and mandibular rami, but not interopercle and gill membranes; scales below midbase of first dorsal fin 4.5 to 8. Pyloric caeca short, 11 to 14. **Colour:** overall brownish, darker in adults; fins and naked areas blackish; gill and mouth cavities blackish.

Geographical Distribution : Cocos Island (04°50′N) to central Chile (32°S) and Galapagos (Fig. 485).

Habitat and Biology : Benthopelagic in 300 to 1645 m, but most common in 600 to 1200 m depth.

Size : To 51 cm total length.

Interest to Fisheries : Taken as bycatch by trawlers, but no separate statistics recorded.

Local Names : PERU: Peje-rata, Ratón.

Literature : Chirichigno & Iwamoto (1977).

Remarks : A peculiar species most notable for the tridentate spinules on body scales of large individuals.

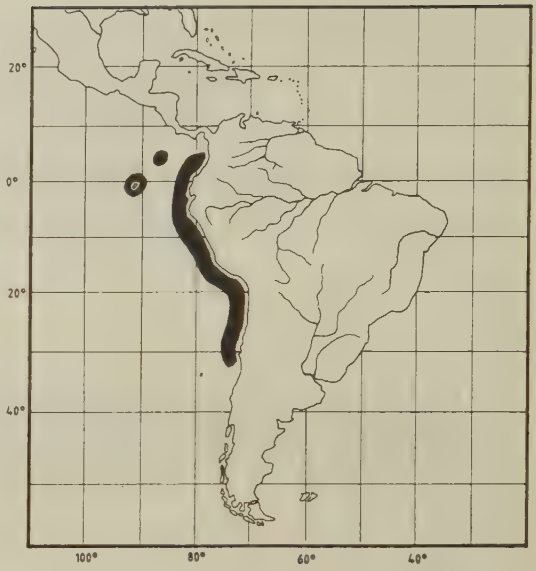


Fig. 485

Coryphaenoides guentheri (Vaillant, 1888)

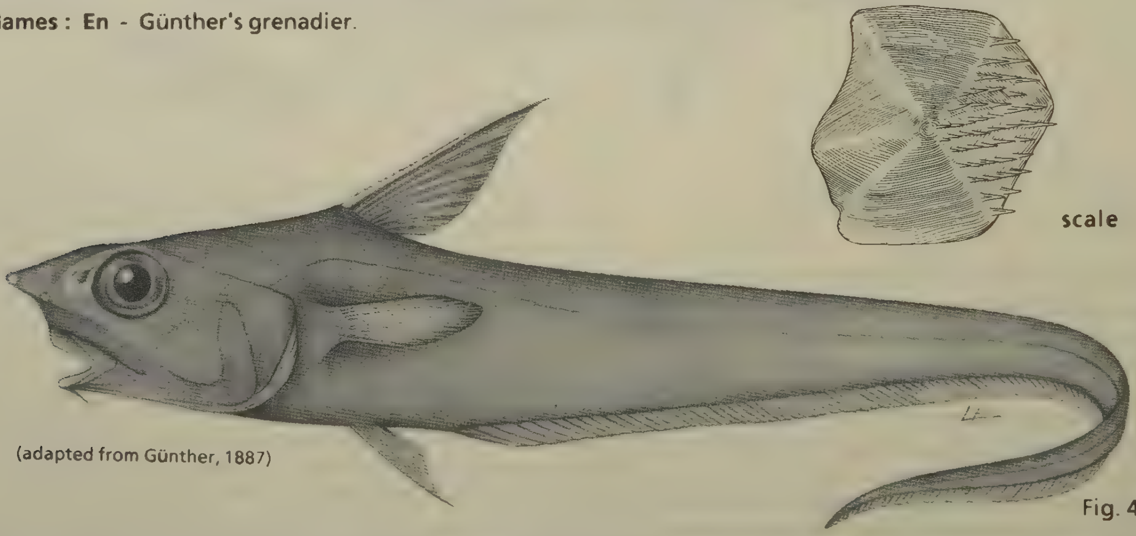
Fig. 486

MACROUR Cory 8

Scientific Name with Reference : ***Macrurus guentheri*** Vaillant, 1888, Exped.Sci.TRAVAILLEUR et TALISMAN Poissons, Paris:386 (Atlantic off Morocco; 30°01′N, 11°46′W; 2200 and 2115 m).

Synonyms : ***Macrurus sclerorhynchus*** (non Valenciennes)-Günther, 1887; ***Macrurus holotrachys***--Vaillant, 1887; ***Macrurus guentheri***--Collett, 1896; ***Macrurus ingolfi*** Lütken, 1898; ***Coryphaenoides (Macrurus) guentheri***-- Collett, 1905; ***Coryphaenoides ingolfi***--Gilbert & Hubbs, 1916; ***Coryphaenoides guentheri***-Gilbert & Hubbs, 1916; ***Lionurus guntheri***--Farran, 1924; ***Macruroplus guentheri***--Fowler, 1936; ***Chalinura guentheri***--Nybelin, 1948.

FAO Names : **En** - Günther's grenadier.



(adapted from Günther, 1887)

Fig. 486

Diagnostic Features : Body slender, its greatest depth about equal to postrostral length. Snout acute, pointed, with stout terminal and lateral scutes; mouth small, restricted laterally, its opening extends posteriorly only to below anterior margin of pupil, upper jaw extends to mid-orbit; barbel short, thin, less than 20% of head length; orbit diameter about equal to or slightly smaller than snout, about equal to interorbital space; suborbital region angulate; a stout, narrow shelf two scales wide below orbit; teeth in broad villiform bands in both jaws; premaxillary band falls short of end of rictus, mandibular band to end of rictus; preopercular ridge strongly angulated; inner gill rakers on first arch 1 or 2 + 7 or 8 (9 or 10 total); outer gill rakers on second arch 1 or 2 + 6 or 7 (8 or 9 total). Measurements in percentage of head length: snout length 31 to 34; preoral length 21 to 24; orbit diameter 28 to 30; suborbital shelf 12 to 14; interorbital space 21 to 26; upper jaw 28 to 31; barbel 9 to 13; isthmus to anal fin origin 73 to 85; interspace between first and second dorsal fins 16 to 48; gill membranes strongly attached to isthmus, without a free fold.

First dorsal fin with 2 spines and 9 to 11 rays; teeth along leading edge of spinous first dorsal ray slender, sharp, and prominent; pectoral fin rays i18 to i21; pelvic fin rays 7 or 8 (usually 8). Scales with short, conical, greatly reclined spinules in as many as 8 parallel rows on scales below second dorsal fin; underside of head almost entirely naked from snout tip to below posterior 1/4 of orbit; leading edge of snout and upper anterior margin naked; scales below midbase of first dorsal fin about 5, below second dorsal fin base 6.5 to 7.5. **Colour:** overall light greyish brown; bluish over abdomen and gill cover; mouth and gill cavities black; fins dusky to pale.

Geographical Distribution : Eastern North Atlantic from about 61°N to 20°N and in the western Mediterranean (Fig. 487).

Habitat and Biology : Benthopelagic in 831 to 2830 m depth. Feeds on annelids, isopods and mysids.

Size : To at least 50 cm total length.

Interest to Fisheries : None.

Literature : Vaillant (1888); Collett (1896); Koefoed (1927); Nybelin (1948); Marshall & Iwamoto (in Marshall, 1973); Merrett (1978).

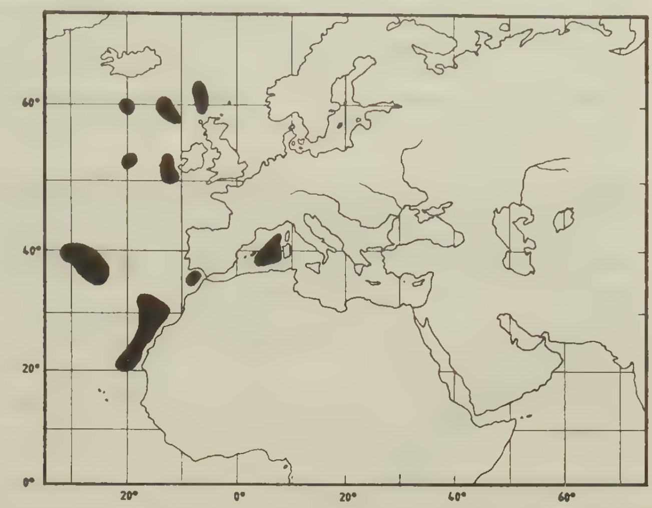


Fig. 487

Coryphaenoides longifilis (Günther, 1877)

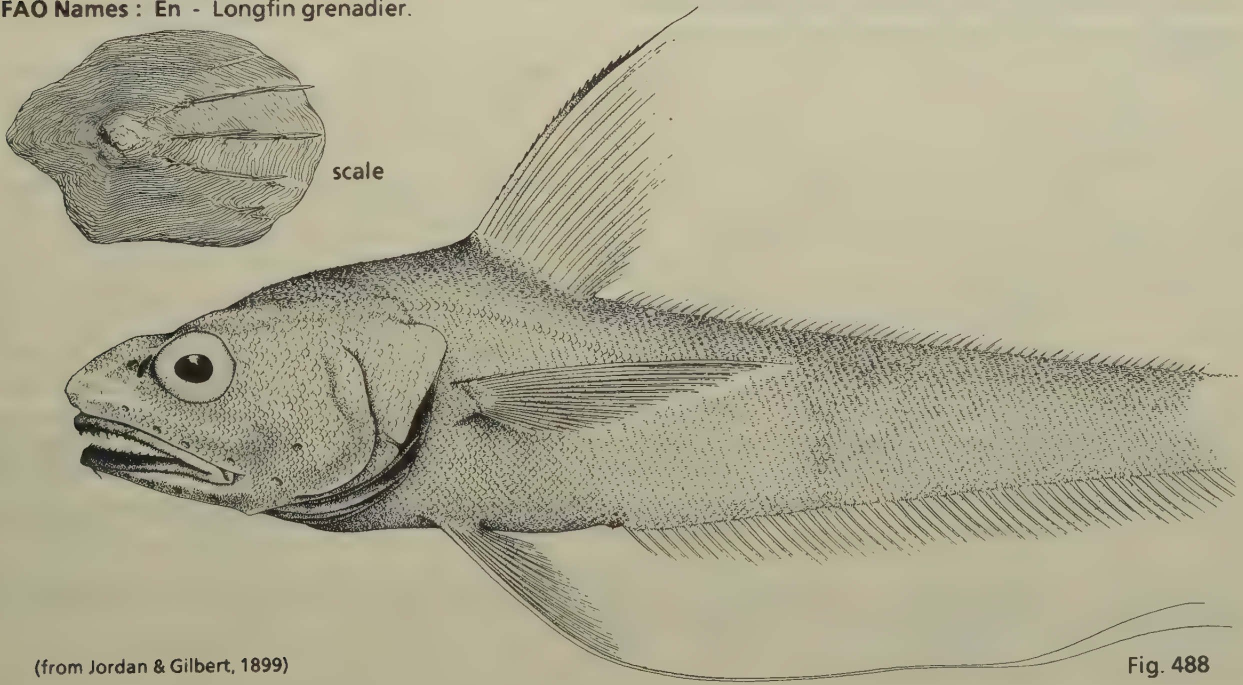
Fig. 488

MACROUR Cory 9

Scientific Name with Reference : ***Coryphaenoides longifilis*** Günther, 1887, Ann.Mag.Nat.Hist., ser.4, 20:439 (south of Tokyo, Japan; 34°07'N, 138°00'E; 1033 m).

Synonyms : ***Macrourus (Nematonurus) longifilis***--Günther, 1887; ***Moseleya longifilis***--Goode & Bean, 1896; ***Bogoslovius clarki*** Jordan & Gilbert, in Jordan & Evermann, 1898; ***Dolloa longifilis***--Jordan, 1900; ***Coryphaenoides (Nematonurus) longifilis***--Gilbert & Hubbs, 1916; ***Nematonurus longifilis***--Kamohara, 1952.

FAO Names : En - Longfin grenadier.



(from Jordan & Gilbert, 1899)

Fig. 488

Diagnostic Features : General characters as for the subgenus ***Bogoslovius*** of which this is the only species. Chin barbel very small; interspace between first and second dorsal fins very short, 1.0 to 1.5 into first dorsal fin base; inner gillrakers on first arch 2 or 3 + 12 or 13 (total 14 to 16); outer rakers on second arch 1 to 3 + 11 to 13 (total 13 to 15). Measurements in percentages of head length: snout length 25 to 31; orbit diameter 20 to 25; interorbital space 23 to 24; suborbital shelf 10 to 13; upper jaw 43 to 47; barbel 2 to 4; length outer gill slit 21 to 23; preanal distance 130 to 147; isthmus to anal fin origin 74 to 87; height of first dorsal fin 72 to 87; length of pectoral fin 77 to 114; outer pelvic fin ray 136 to 192; interspace between first and second dorsal fins 11 to 15. First dorsal fin with 2 spines and 12 to 14 rays; pectoral fin rays i15 to i18; pelvic fin rays 9 or 10. Scales thin, small, cover almost all of head and body; lower jaws finely scaled; gill membranes naked; spinules on body scales short, erect, in 3 to 5 divergent rows; scales below midbase of first dorsal fin 11 to 13; below second dorsal fin 12 to 15. Pyloric caeca 10 to 12. **Colour:** light brown overall, fins dusky to somewhat swarthy, mouth and gill cavities black; lips and branchiostegal membranes blackish.

Geographical Distribution : Southern Japan to Bering Sea (Fig. 489).

Habitat and Biology : Benthopelagic in 700 to 1700 m depth.

Size : To more than 70 cm total length.

Interest to Fisheries : Incidental catch; used for fish paste in Japan.

Local Names : JAPAN: Himodara.

Literature : Günther (1878); Jordan & Gilbert (1899); Gilbert & Hubbs (1916); Makushok (1964); Okamura (1970); Iwamoto & Stein (1974).

Remarks : This species is included in a separate subgenus ***Bogoslovius*** Jordan & Gilbert, 1898, because of its considerable differences from other members of the genus. It shows many similarities with the subgenus ***Chalinura*** and has been included in that taxon, but the retia mirabilia numbers, the premaxillary dentition, the shape of the rostrum, and the elongated pectoral rays suggest a distant relationship. Aside from the dentition, these same characters and others (e.g., length of abdomen, distance between dorsal fins, and general head physiognomy) suggest an even farther separation from subgenus ***Nematonuus.***

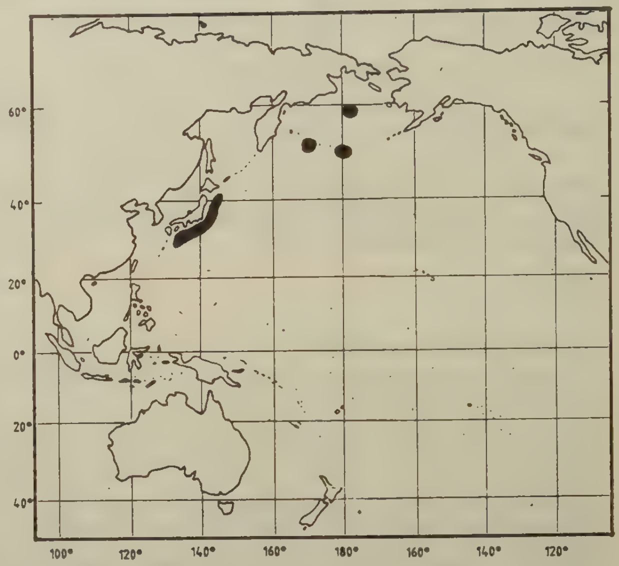


Fig. 489

Coryphaenoides macrocephalus (Maul, 1951)

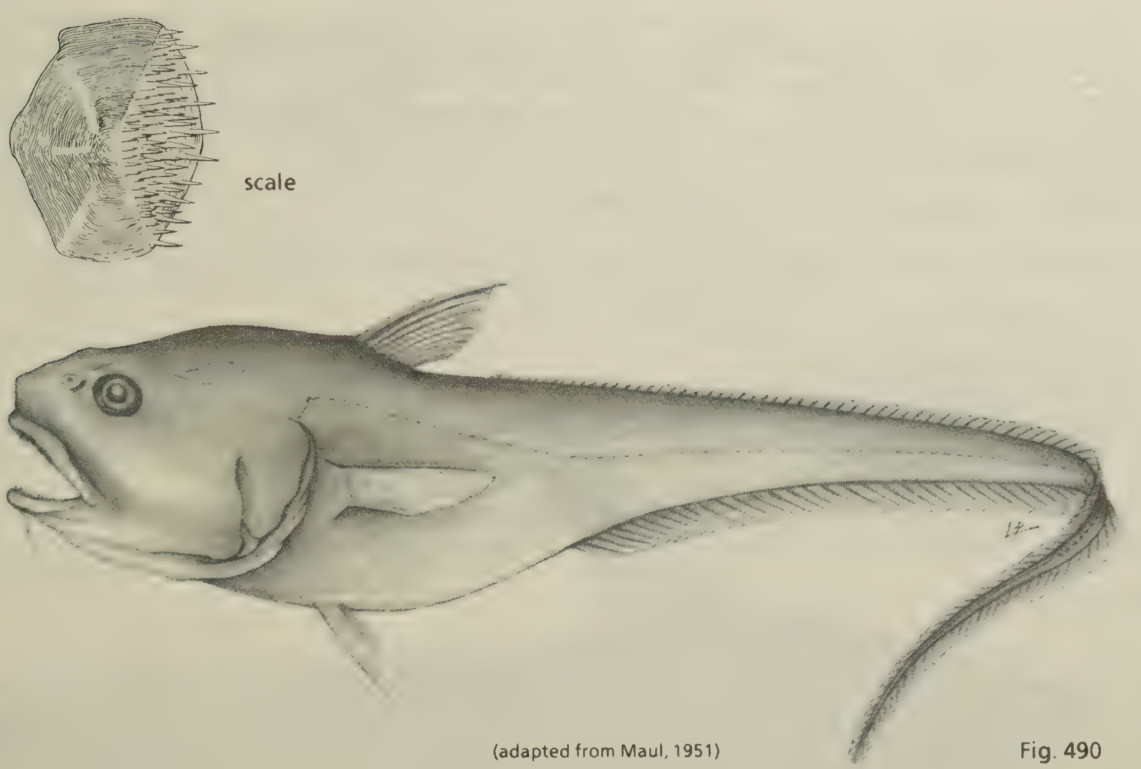
Fig. 490

MACROUR Cory 10

Scientific Name with Reference : ***Nematonurus macrocephalus*** Maul, 1951, Bol.Mus.Munic.Funchal, (5) (art.12):17, figs 3,4 (Madeira; 600 to 1000 m).

Synonyms : ***Coryphaenoides macrocephalus***--Marshall & Iwamoto, in Marshall, 1973; ***Coryphaenoides (Coryphaenoides) macrocephalus***--Merrett & Marshall, 1981.

FAO Names : **En** - Bighead grenadier.



(adapted from Maul, 1951)

Fig. 490

Diagnostic Features : A large species. Snout low, scarcely protruding; mouth large, almost terminal, upper jaw extends to below posterior margin of orbits; teeth strong, in narrow bands in premaxillary, outer series enlarged; mandibular teeth in 3 or 4 irregular series tapering to 2 irregular rows; inner gill rakers on first arch 10 total; outer gill rakers on second arch 8 or 9. Measurements in percentage of head length: snout length 23 to 29; orbit diameter 16 to 26; interorbital space 26 to 30; upper jaw 37 to 43; barbel 10 to 23; interspace between first and second dorsal fins 16 to 31. First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays usually i19 to i20; pelvic fin rays 9 to 11 (usually 10). Head fully scaled except exposed posterior end of interopercle and gill membranes; no suborbital ridge developed; scale spinules numerous, small, sharp, conical, arranged in irregularly divergent to roughly quincunx pattern; scales below second dorsal fin 6 or 7. Pyloric caeca 12 to 16. **Colour:** overall light to dark brown or greyish brown; fins somewhat darker.

Geographical Distribution : Known from Madeira, Gulf of Mexico, and Caribbean Sea, but probably more widely distributed in Atlantic (Fig. 491).

Habitat and Biology : Benthopelagic in 600 to 2375 m depth. Feeds on cephalopods, at least at larger sizes.

Size : To at least 110 cm total length.

Interest to Fisheries : Taken on rare occasions off Madeira on "espada" gear.

Literature : Maul (1951); Marshall & Iwamoto, in Marshall (1973).

Remarks : This species is probably a synonym of ***C. paradoxus*** of the Pacific.

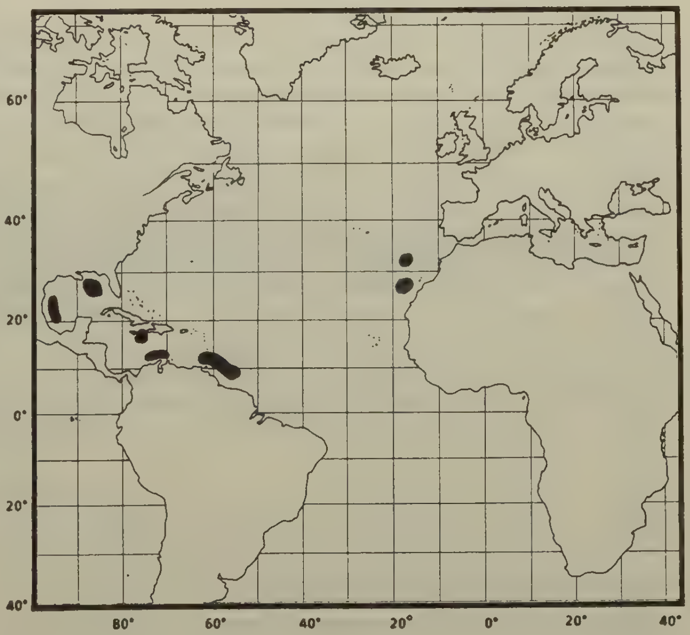


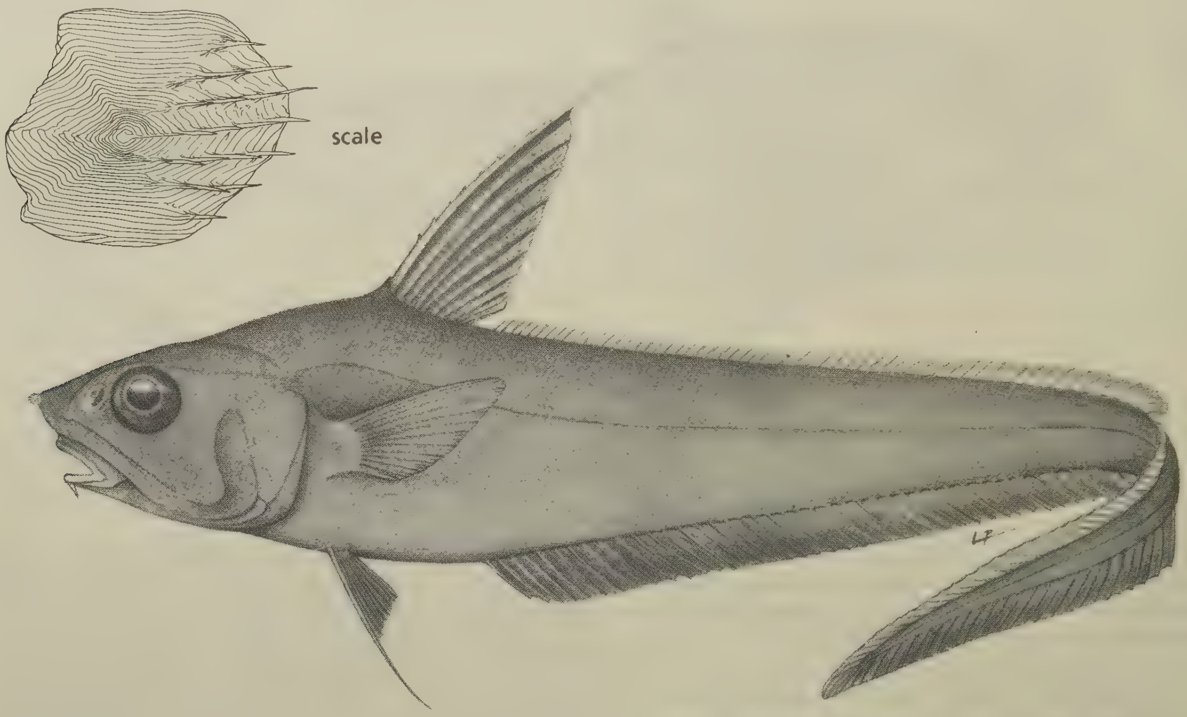
Fig. 491

Coryphaenoides marginatus Steindachner & Döderlein, 1887 Fig. 492 **MACROUR Cory 11**

Scientific Name with Reference : ***Coryphaenoides marginatus*** Steindachner & Döderlein, 1887, Beiträge zur Kenntniss der Fische Japans, 4:280 (near Tokyo, Japan).

Synonyms : ***Coryphaenoides awae*** Jordan & Gilbert, 1904.

FAO Names : **En** - Amami grenadier.



(after Okamura, 1970a)

Fig. 492

Diagnostic Features : A medium-sized species. Snout short, pointed, tipped with a stout conical tubercle at tip and lateral angles; suborbital ridge prominent; mouth small, its rictus restricted posteriorly by lip folds, extending only to below nostrils; the maxillary extends posteriorly to below anterior edge of pupil; teeth small, in broad bands in both jaws; outer series slightly enlarged in upper jaw; barbel very small, 2.1 to 4.6 times the orbit diameter; preopercle margin broadly rounded, not lobelike; interopercle exposed posteroventrally beyond preopercle; gill membranes broadly attached to isthmus, no free fold posteriorly; opercular opening restricted, scarcely extended forward to below preopercle ridge; outer gill slit small, about equal to or smaller than 1/4 of orbit diameter ; inner gill rakers on first arch 0 or 1 + 9 or 10. Measurements in percentage of head length: snout 26 to 31; orbit diameter 20 to 29; interorbital space 18 to 24; upper jaw 27 to 33; barbel 6 to 10; orbit to angle of preopercle 35 to 40; body depth 75 to 83; height of first dorsal fin 171 to 219; outer pelvic fin ray 48 to 65; interspace between first and second dorsal fins 15 to 29. First dorsal fin with 2 spines and 9 to 11 rays; second spinous dorsal fin ray greatly elongated,1.5 to 2.0 times the head length; denticulations sharp, widely spaced (reduced in large adults); pectoral fin rays i18 to i21; pelvic fin rays 7 or 8. Scales below midbase of first dorsal fin 6 or 7. Scales rather deciduous; most of head scaled, except underside of snout and anteriorly on mandibular rami; body scales with long slender spinules in 7 to 19 parallel rows. Pyloric caeca 11 to 14, short, about 1/2 of orbit diameter, directed anteriorly. **Colour:** ground colour purplish brown, paler ventrally on head and trunk; oral and branchial cavities blackish; fins blackish.

Geographical Distribution : Southern Japan to East China Sea (Fig. 493).

Habitat and Biology : Benthopelagic in sandy mud bottoms at depths of 250 to 790 m (5 to 7°C); locally abundant.

Size : To at least 62 cm total length.

Interest to Fisheries : Taken in bycatch of trawlers off Japan where it is sometimes used for fish paste.

Local Names : JAPAN: Heri-dara.

Literature : Günther (1887); Gilbert & Hubbs (1916); Okamura (1970a); Okamura (in Okamura et al., 1982); Yatou (in Okamura & Kitajima, 1984).

Remarks : Okamura (1970a) synonymized ***C. awae*** Jordan & Gilbert, 1904, with this species, attributing purported differences between ***C. awae*** and ***C. marginatus*** to size-related changes.

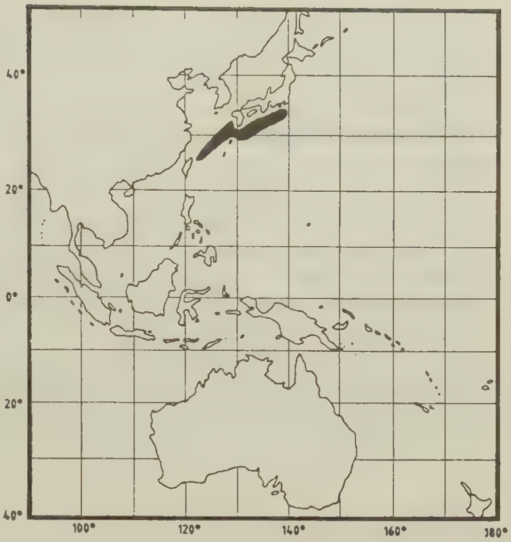


Fig. 493

Coryphaenoides mexicanus (Parr, 1946)

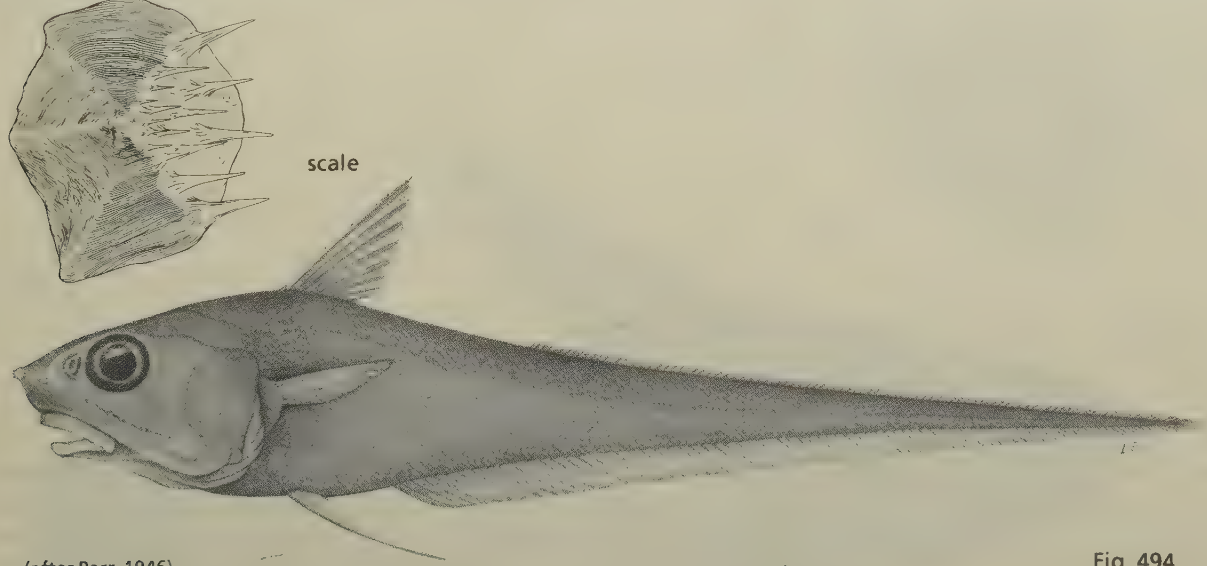
Fig. 494

MACROUR Cory 12

Scientific Name with Reference : ***Cariburus mexicanus*** Parr, 1946, Bull.Bingham Oceanogr.Coll., 10 (art.1):62, figs 9,19 (Gulf of Mexico; 29°13'N, 87°44'N; 841 to 924 m).

Synonyms : ***Coryphaenoides mexicanus***--Marshall & Iwamoto, in Marshall, 1973.

FAO Names : **En** - Mexican grenadier.



(after Parr, 1946)

Fig. 494

Diagnostic Features : A medium-sized species. Snout broadly acute, with a stout conical tubercle at tip and lateral angles; barbel small, shorter than suborbital width; inner gill rakers on first arch 1 + 8; outer gill rakers on second arch 1 + 7;. Measurements in percentage of head length: snout length 30 to 34; preoral length 17 to 21; orbit diameter 26 to 29; interorbital space 20 to 25; upper jaw 26 to 34; barbel 6 to 10; outer gill slit 5 to 10. First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays i19 to i21; pelvic fin rays 9 or 10 (usually 10). Scales cover all of head except lips, gill membranes, and interopercle tip; body scales with less than 20 sharp, slender spinules in widely divergent rows, or irregularly quincunx pattern; scales below midbase of first dorsal fin 6. **Colour:** pale to medium brown overall; fins similar; orbital rim and nostrils dark brown.

Geographical Distribution : Gulf of Mexico (and probably Caribbean Sea, but no records on hand to verify this) (Fig. 495).

Habitat and Biology : Benthopelagic in 730 to 1600 m depth.

Size : To at least 40 cm total length.

Interest to Fisheries : A rather common species in the Gulf of Mexico in about 800 to 1200 m depth, but taken only incidentally by trawlers.

Literature : Parr (1946); Marshall & Iwamoto, in Marshall (1973).

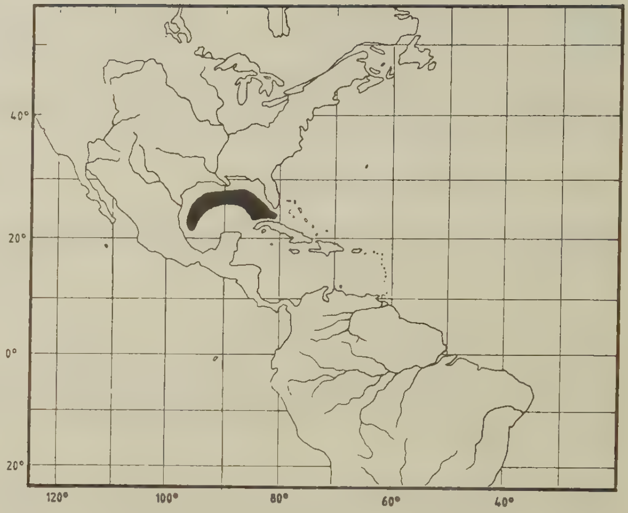


Fig. 495

Coryphaenoides nasutus Günther, 1877

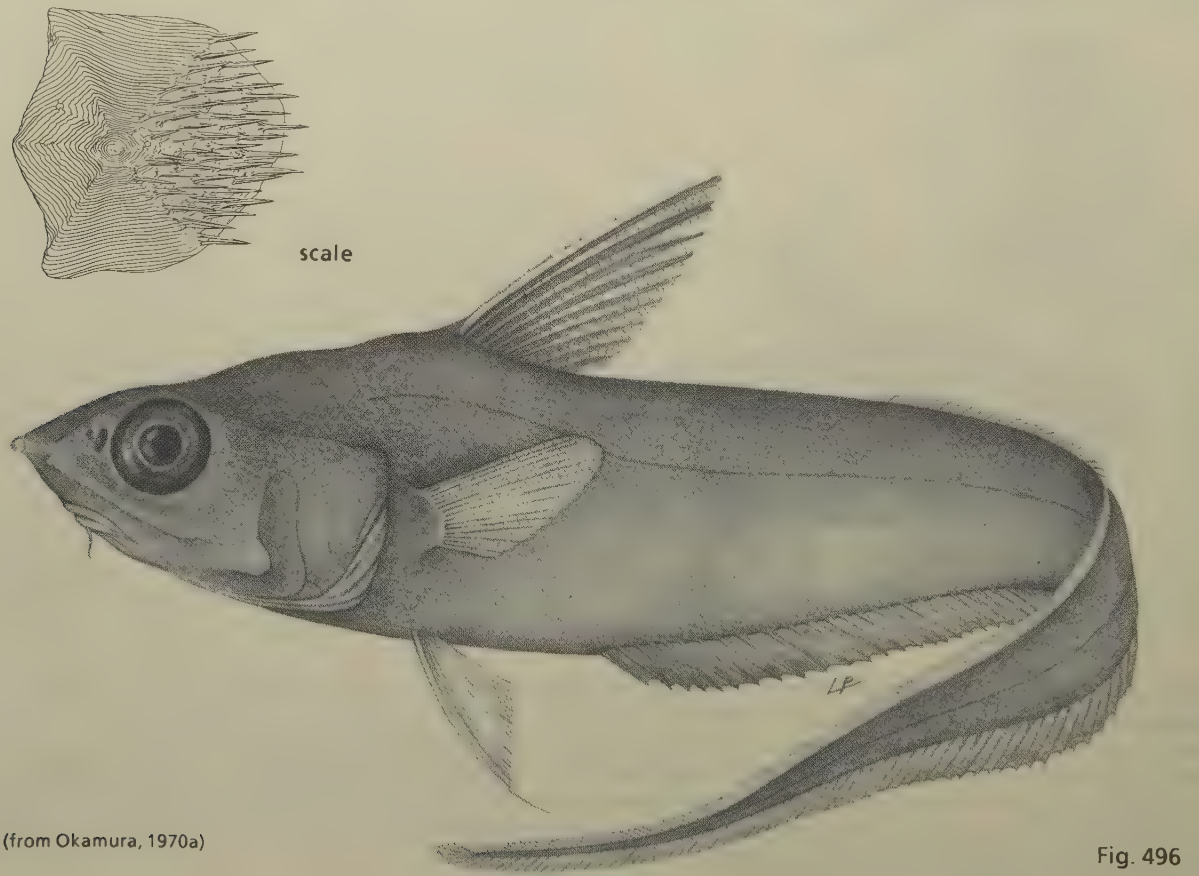
Fig. 496

MACROUR Cory 13

Scientific Name with Reference : ***Coryphaenoides nasutus*** Günther, 1877, Ann.Mag.Nat.Hist., ser.4, 20:440 (south of Tokyo).

Synonyms : ***Macrurus nasutus***--Günther, 1887.

FAO Names : En - Largenose grenadier.



(from Okamura, 1970a)

Fig. 496

Diagnostic Features : A medium-sized species. Snout short, pointed, tipped with a large conical tubercular scale at tip and smaller tubercles at lateral angles; suborbital ridge prominent; mouth small, its rictus restricted posteriorly by lip folds, extending only to below nostrils; the maxillary extends posteriorly to below anterior 1/3 of orbit; teeth small, in broad bands in both jaws, outer series slightly enlarged in upper jaw; barbel very small, 2.1 to 3.6 times into orbit diameter; preopercle margin broadly rounded, not lobelike; preopercular ridge produced at angle; interopercle narrowly exposed beyond preopercle; gill membranes broadly attached to isthmus, no free fold posteriorly; opercular opening extends to below preopercle ridge angle; inner gill rakers on first arch 1 or 2 + 7 to 9. Measurements in percentage of head: snout 24 to 35; orbit diameter 22 to 35; interorbital space 20 to 27; upper jaw 25 to 33; barbel 5 to 8; orbit to angle of preopercle 39 to 43; body depth 68 to 79; height of first dorsal fin 82 to 110; outer pelvic fin ray 48 to 66; interspace between first and second dorsal fins 77 to 93. First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays i18 to i23; pelvic fin rays 9 or 10; second spinous ray of first dorsal fin about 0.8 to 1.3 in head length, weakly produced, denticulations widely spaced; outer pelvic fin ray slightly produced, scarcely extends to anal fin origin. Scales coarse and tightly adherent. Most of head except underside of snout scaled; scales on body with long, appressed spinules in convergent rows, except those on nape and chest, which are in divergent rows; scale rows below midbase of first dorsal fin 5 to 6.5. Pyloric caeca 8 to 12, shorter than orbit diameter. **Colour:** ground colour somewhat tawny; oral cavity greyish, branchial cavity blackish; orbital rims blackish; fins dusky, darker distally.

Geographical Distribution : Northern Japan to East China Sea (Fig. 497).

Habitat and Biology : Benthopelagic in sandy and muddy bottoms at depth of 625 to 1180 m and temperatures of 1.5 to 5°C.

Size : To at least 47 cm total length.

Interest to Fisheries : Taken in bycatch of trawlers off northern Japan where it is sometimes used in fish paste.

Local Names : JAPAN: Hana-sokodara.

Literature : Günther (1877, 1887); Gilbert & Hubbs (1916); Okamura (1970a).

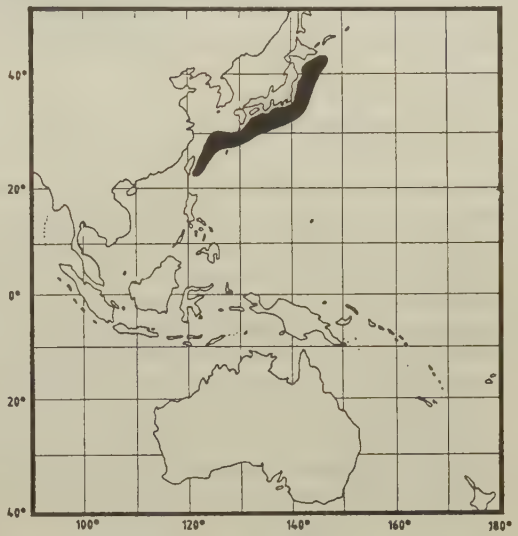


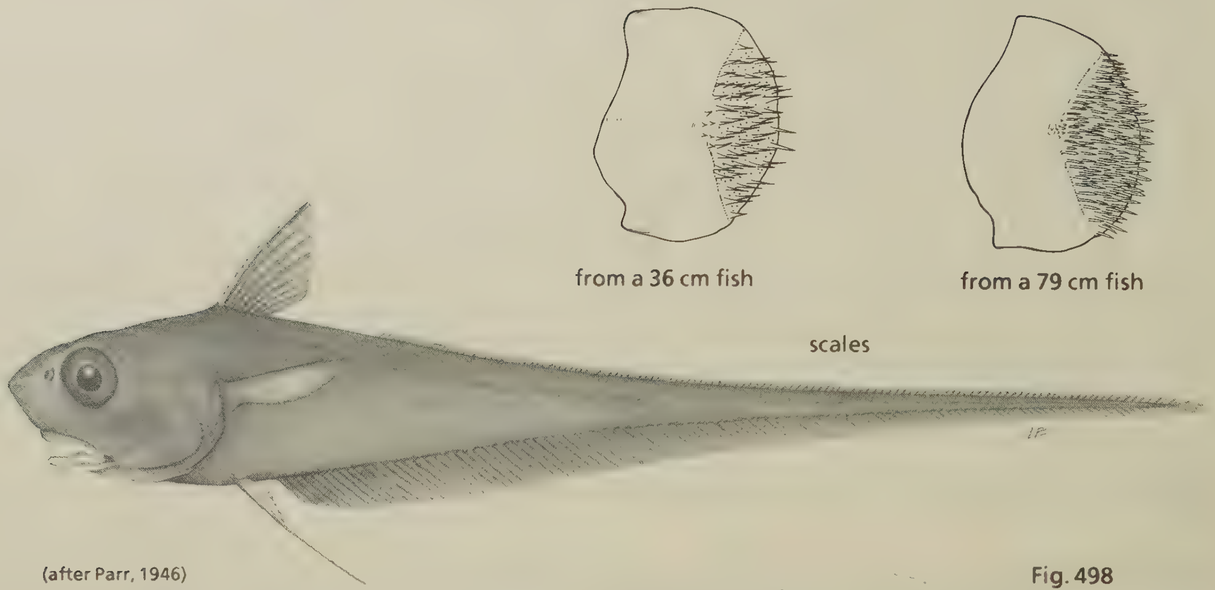
Fig. 497

Coryphaenoides rupestris Gunnerus, 1765 Fig. 498 **MACROUR Cory 14**

Scientific Name with Reference ***Coryphaenoides rupestris*** Gunnerus, 1765, Selsk.Skrift.Trondhj., 3(4):50, pl.3, figs 1-2 (near Trondhjem).

Synonyms : ***Coryphaena rupestris***--Müller, 1776; ***Macrourus stroemii*** Reinhardt, 1832; ***Lepidoleprus norvegicus*** Nilsson, 1832; ***Macrurus norvegicus***--Nilsson, 1885; ***Coryphaenoides norvegicus*** Günther, 1862; ***Macrurus (Coryphaenoides) rupestris***--Günther, 1887; ***Macrurus rupestris***--Smitt, 1895.

FAO Names : En - Roundnose grenadier.


from a 36 cm fish

from a 79 cm fish

scales

(after Parr, 1946)

Fig. 498

Diagnostic Features : A large species. Abdominal region short. Snout broad, rounded, tipped with a large blunt tubercular scute; head broad, rather soft, deep; chin barbel minute; teeth small, conical, in long narrow band in premaxillary, about 3 rows wide, narrowing to 1 row posteriorly, outer series slightly enlarged; in 1 or 2 irregular rows in mandible; interopercle a thin, naked flap; inner gill rakers on first arch 3 + 15 to 17; outer gill rakers on second arch 3 + 15 to 17. Measurements in percentages of head length: snout length 27 to 31; preoral 22 to 28; orbit diameter 29 to 32; interorbital space 29 to 38; upper jaw 35 to 39; suborbital shelf 15 to 17; barbel length 2.5 to 5; isthmus to anal fin origin 51 to 61; interspace between first and second dorsal fin 37 to 54. First dorsal fin with 2 spines and 8 to 11 rays; pelvic fin rays 7 or 8; outer pelvic fin ray elongated, almost equal to head length. Scales relatively adherent, completely and uniformly covering almost all of head and body; a small patch of scales on gular membrane; no modified scutelike scales except at tip of snout; spinules dense on body scales, long, slender, recurved, narrowly lanceolate, with longitudinal anterior concavity; scales below midbase of first dorsal fin 6.5. Pyloric caeca 29 to 31 (long, slender). **Colour**: medium brown to greyish; orbits, mouth, gill cavity, and fins blackish to brownish grey.

Geographical Distribution : Temperate North Atlantic from about 37°N to Baffin Island and Greenland in the western Atlantic, and off Iceland and Norway (66°N) south to North Africa (20°N) in the eastern Atlantic. Middleton & Musick (1986) reported the isolated capture of 2 specimens from the tongue of the Ocean east of Andros Island (about 24°N, 77°W) in the Bahama Islands (Fig. 499).

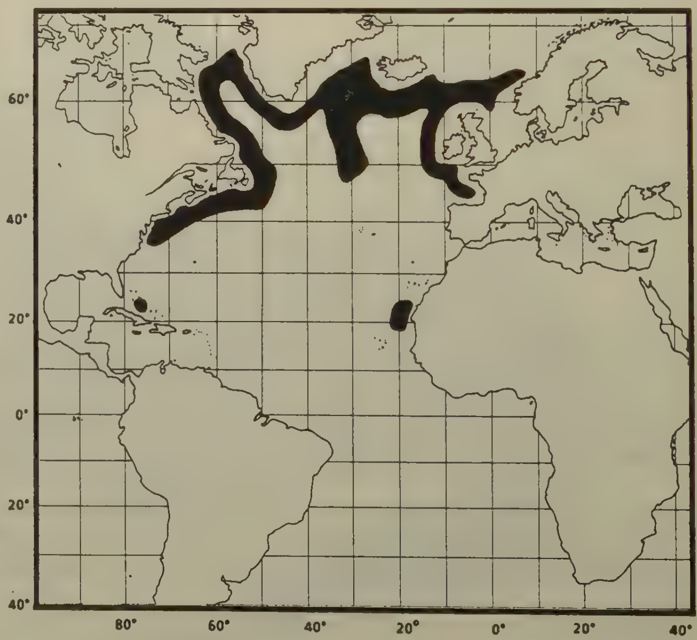


Fig. 499

Habitat and Biology : Benthopelagic to bathypelagic in about 400 to 1200 m depth, but ranges from 180 to 2200 m. The species apparently undergoes spawning migrations as well as diurnal vertical feeding migrations that may carry them more than 1000 m off bottom. During the summer months, it moves to deeper waters, returning to shallower waters in the winter. Spawning is believed to take place in summer and autumn, primarily in Icelandic waters. Females mature at around 60 cm, males at about 40 cm. Fecundity estimates range from 12 000 to 35 500 eggs per female Feeds on a variety of fish and invertebrates, but primarily on pelagic crustaceans such as shrimps, amphipods and cumaceans; cephalopods and lantern fishes constitute a lesser part of the diet.

Size : To more than 100 cm total length.

Interest to Fisheries : Catch statistics in the FAO Yearbook of Fishery Statistics reported 20 846 metric tons of which 12 604 t were taken in the northeastern Alantic (USSR, ca. 10 900 t, Denmark, ca. 1 600 t), and 8 242 t in the northwestern Atlantic (German Democratic Republic, ca. 4 500 t, USSR, ca. 2 700 t, Portugal, ca. 1 000 t, and others). A valuable commercial fish in the North Atlantic currently facing overexploitation. The flesh is of excellent texture and taste, and is consumed directly. The fisheries for the species, begun in the mid-sixties, is by factory stern trawlers, which may fish as deep as 1300 m. The Soviet Union, German Democratic Republic and Poland are the primary countries engaged in this fishery. Maximum catch per unit effort is achieved in the late summer and fall when the species form dense concentrations in 600 to 900 m depth.

Local Names : USA: Black grenadier, Rock grenadier, Roundnose grenadier.

Literature : Parr (1946); Pechenik & Troyanovskii (1969); Nodzyński & Zukowski (1971); Marshall & Iwamoto (in Marshall, 1973); Haedrich (1974); Gushchin & Podrazhanskaya (1984); Middleton & Musick (1986).

Coryphaenoides serrulatus Günther, 1878

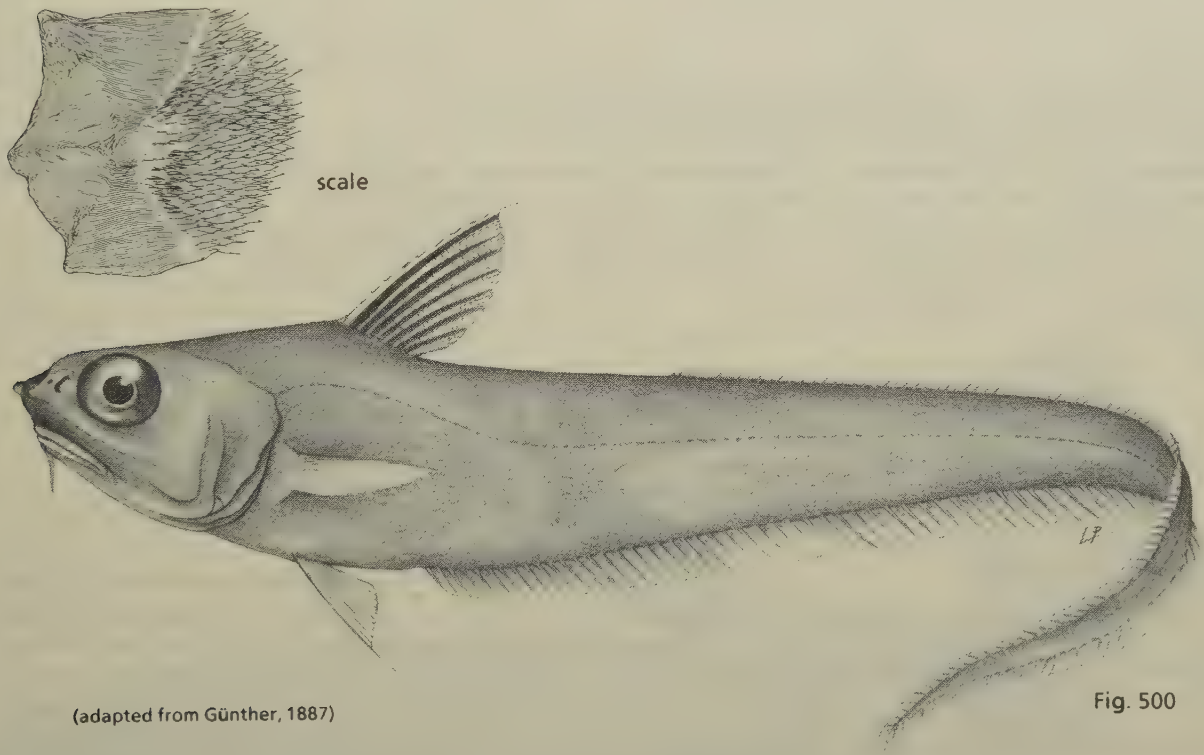
Fig. 500

MACROUR Cory 15

Scientific Name with Reference : ***Coryphaenoides serrulatus*** Günther, 1878, Ann.Mag.Nat.Hist., ser.5, 7:26 (northeast of New Zealand, 1280 m).

Synonyms : ***Macrurus (Coryphaenoides) serrulatus***--Günther, 1887; ***Coryphaenoides (Coryphaenoides) serrulatus***--McCann & McKnight, 1980.

FAO Names : En - Serrulate whiptail.



(adapted from Günther, 1887)

Fig. 500

Diagnostic Features : A medium-sized species of the subgenus ***Chalinura***. Snout blunt, scarcely protruding beyond the large mouth; terminal and lateral angles with large, stout tubercular scutes; the maxillary extends to below posterior margin of orbits; barbel stout, 1.2 to 1.3 times into orbit diameter; teeth small, in a band in upper jaw, outer series enlarged; mandibular teeth small, in a single row except at symphysis; outer series of gill rakers papilla-like, their length about twice the width in the longest rakers; gill membranes narrowly united below posterior edge of orbits; inner gill rakers on first arch 1 or 2 + 11 or 12. Measurements in percentages of head length: snout 25 to 28; orbit diameter 30 to 36; interorbital space 18 to 22; suborbital width 11 to 13; upper jaws 39 to 41; barbel 20 to 26; outer gill slit 15 to 20; isthmus to anal fin origin 92 to 119; interspace between first and second dorsal fins 56 to 107.

First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays i18 to i22; pelvic fin rays 7 ; fin rays not especially prolonged. Scales adherent, densely covered with distinctly shield-shaped imbricate spinules; underside of head scaled; interopercle naked; a double row of enlarged scales on suborbital shelf; sensory pores of head prominent, especially ventrally; scales below midbase of first dorsal fin 5.5 to 6.5. Pyloric caeca short, directed anteriorly, about 17. **Colour:** dark grey overall; fins, gill membranes, and orbital rim black; mouth and gill cavities blackish.

Geographical Distribution : New Zealand, Tasman Sea, south of Tasmania, southeast Australia (Victoria), and possibly also across the Indian Ocean (Fig. 501).

Habitat and Biology : Benthopelagic in 750 to 2070 m depth.

Size : To at least 45 cm total length.

Interest to Fisheries : Trawled commonly in depths exceeding 900 m off Tasmania.

Local Names : TASMANIA: Serrulate rattail.

Literature : Günther (1887); McCann & McKnight (1980); Last et al. (1983).

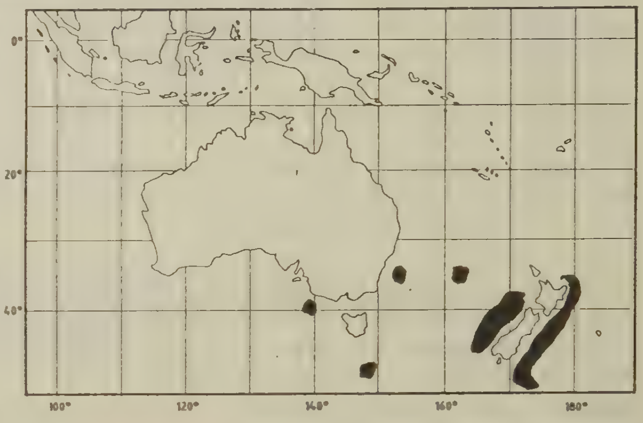


Fig. 501

Remarks : This species is closely related to ***C. subserrulatus*** Makushok, but it lacks the prolonged pectoral and pelvic rays of that species, has a longer barbel, fewer gill rakers, more pectoral fin rays, broader scale spinules, and more complete scale covering on the snout. Soviet collections in Moscow contain numerous representatives of what are possibly a subspecies of ***C. serrulatus*** from the Indian Ocean. These specimens come from the Great Australian Bight, Broken Ridge (West Australian Ridge), and Madagascar Ridge.

Coryphaenoides subserrulatus Makushok, 1976

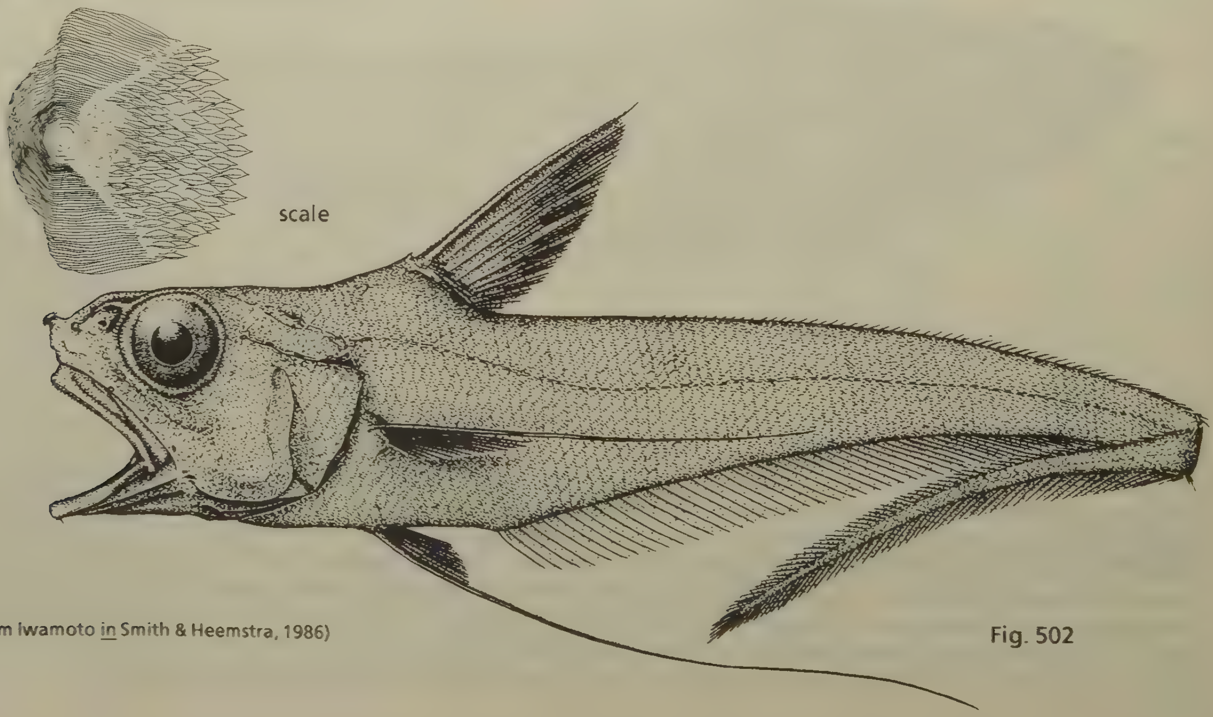
Fig. 502

MACROUR Cory 16

Scientific Name with Reference : ***Coryphaenoides subserrulatus*** Makushok, 1976, Tr.Shirshov Inst. Oceanol. Akad.Nauk SSSR, 104:144 (east of Campbell Island; 52°20'S, 166°13'E; 1148 to 1180 m).

Synonyms : ***Coryphaenoides (Coryphaenoides) quadripennatus*** McCann & McKnight, 1980.

FAO Names : En - Longrayed whiptail.



(from Iwamoto in Smith & Heemstra, 1986)

Fig. 502

Diagnostic Features : A rather small species of the subgenus ***Chalinura***. Snout bluntly pointed, scarcely protruding beyond large mouth; terminal and lateral angles with large, stout tubercular scutes; the maxillary extends to below posterior margin of orbits; barbel rudimentary, more than 6 times into orbit diameter; teeth small, in a narrow band in upper jaw, outer series slightly enlarged, with arrowhead-shaped tips; mandibular teeth small, in 1 or 2 irregular rows laterally but clustered at symphysis; outer series of gill rakers papilla-like, their length about twice the width (in the longest rakers); gill membranes narrowly united under posterior edges of orbits; inner gill rakers on first arch 2 + 15 to 17. Measurements in percentages of head length: snout 27 to 29; orbit diameter 30 to 32; interorbital space 21 to 25; suborbital width 8 or 9; upper jaw 45 to 46; barbel 2 to 5; outer gill slit 21 to 27; isthmus to anal fin origin 92 to 102; interspace between first and second dorsal fins 46 to 54. First dorsal fin with 2 spines and 10 or 11 rays; pectoral fin rays i13 to i16; pelvic fin rays 7; second pectoral and first (outer) pelvic fin rays greatly elongated. Scales adherent, densely covered with distinctly lanceolate, much reclined, imbricate spinules arranged in V-shaped rows; underside of snout and anteriorly on lower jaws naked; narrow suborbital shelf with a single row of coarsely modified scales (a second row of small scales anteriorly). Sensory pores of head prominent; scales below first dorsal fin origin 8 or 9, below midbase of first dorsal fin 5 or 6. Pyloric caeca short, directed anteriorly, 10 to 12; retia mirabilia 6. **Colour:** brownish grey overall, entire circumference of trunk broadly darker; fins dusky; gill and mouth cavities blackish.

Geographical Distribution : New Zealand, south of Tasmania, off Campbell Island, off Chatham Island, South Africa, southwestern Atlantic off Falkland/Malvinas Islands and Argentina (Fig. 503).

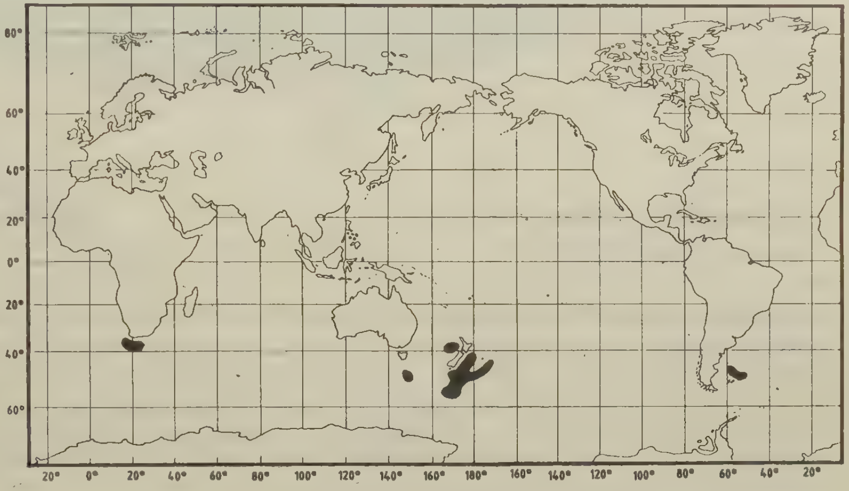


Fig. 503

Habitat and Biology : Benthopelagic in 915 to 1180 m depth.

Size : To at least 37 cm total length.

Interest to Fisheries : Trawled commonly in depths of 900 to 1050 m off Tasmania.

Local Names : TASMANIA: Long-rayed whiptail.

Literature : Makushok (1976); McCann & McKnight (1980); Last et al. (1983); Trunov & Konstantinov (1985).

Coryphaenoides zaniophorus (Vaillant, 1888)

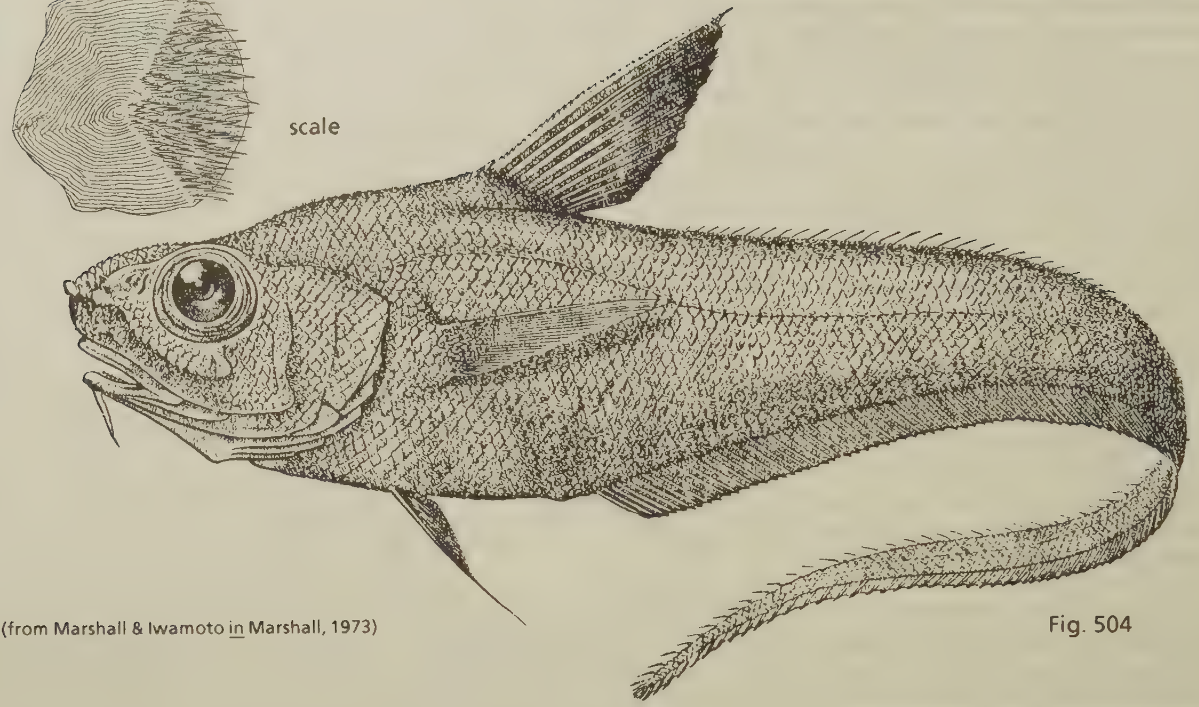
Fig. 504

MACROUR Cory 17

Scientific Name with Reference : ***Macrurus zaniophorus*** Vaillant, 1888, Exped.Sci.TRAVAILLEUR et TALISMAN, Poissons, Paris:245, pl.22, figs 4, 4a (off Spanish Sahara; 23°00'N, 17°30'W; 932 m).

Synonyms : ***Coryphaenoides (Coryphaenoides) zaniophorus***--Gilbert & Hubbs, 1916; ***Cariburus zaniophorus***-- Parr, 1946; ***Coryphaenoides colon*** Marshall & Iwamoto, in Marshall, 1973.

FAO Names : En - Thickbeard grenadier.



(from Marshall & Iwamoto in Marshall, 1973)

Fig. 504

Diagnostic Features : Snout short, narrow, tipped with stout terminal and lateral scutes; mouth small, restricted laterally, its opening extends posteriorly only to below anterior margin of orbit; upper jaw falls short of mid-orbit; barbel short, stout, less than 20% of head length; orbits large, their diameter much smaller than snout, almost twice the interorbital space; teeth in broad villiform bands in both jaws; inner gill rakers on first arch 1 + 10 or 11; outer gill rakers on second arch 1 + 9; scales below midbase of first dorsal fin 6 or 7, below second dorsal fin 7. Measurements in percentages of head length: snout length 25 to 30; preoral length 14 to 15; orbit diameter 30 to 35; suborbital width 14 to 15; interorbital space 15 to 21; upper jaw 33 to 36; barbel 14 to 19. First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays usually i22 to i24; pelvic fin rays 9 or 10; pelvic fins rather far forward, in advance of pectoral origin, both of which are far in advance of first dorsal fin. Scales with numerous (over 100 in large specimens) short, stout spinules in V-shaped rows; head fully scaled, including ventral surfaces of snout; exposed ventral and posterior margin of interopercle scaled. Pyloric caeca short, 10 to 15 total. **Colour:** medium to dark brown; fins generally blackish.

Geographical Distribution : Warm waters of North Atlantic, from Caribbean, Gulf of Mexico, to off Chesapeake Bay in the west, and from Mauritania to Ivory Coast in the east (Fig. 505).

Habitat and Biology : Benthopelagic in 400 to 2165 m depth. Feeds primarily on benthic organisms, especially gammarian amphipods and, to a lesser extent, lamellibranchs, copepods, polychaetes, ostracods, isopods, mysids, Natantia, and echinoderms.

Size : To at least 40 cm total length.

Interest to Fisheries : A fairly common species in 700 to 1000 m depth in the Gulf of Mexico, but currently of no commercial interest.

Literature : Parr (1946); Iwamoto (1970); Marshall & Iwamoto, in Marshall (1973); Geistodoerfer (1978); Merrett & Marshall (1981).

Remarks : Merrett & Marshall (1981) synonymized ***C. colon*** with ***C. zaniophorus***, attributing differences in proportional measurements used to distinguish ***C. colon*** to allometric growth.

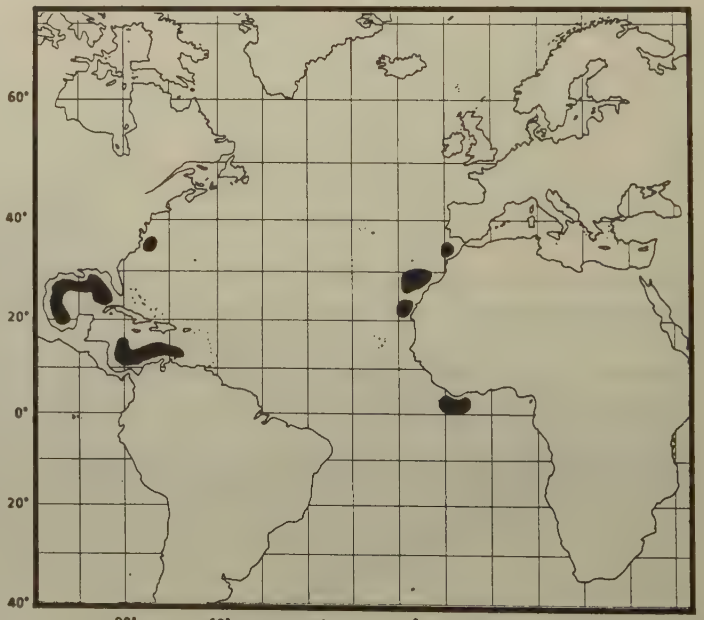


Fig. 505

Cynomacrurus Dollo, 1909

MACROUR Cyno

Genus with Reference : ***Cynomacrurus piriei*** Dollo, 1909, Proc.Roy.Soc.Edinburg, 29(4):316-26 (type species ***Cynomacrurus piriei*** Doll, 1909, by monotypy).

Synonyms : None.

Diagnostic Features : Mouth terminal; lower jaw with one row of 4 to 11 canine teeth; upper jaw teeth small, in a narrow band, a pair of fanglike teeth at anterolateral corners; branchiostegal rays 6; no barbel. Lateral line canal in two sections; anus at origin of anal fin; no light organ. Bathypelagic.

Remarks : Only a single species known.

Cynomacrurus piriei Dollo, 1909

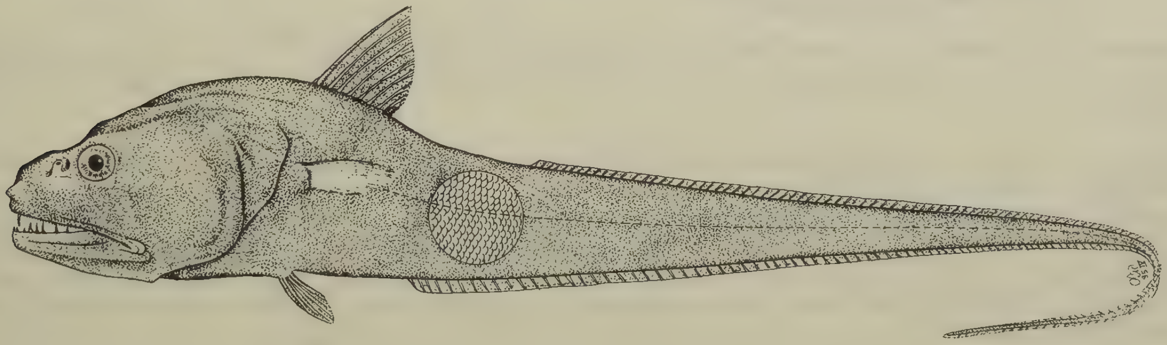
Fig. 506

MACROUR Cyno 1

Scientific Name with Reference : ***Cynomacrurus piriei*** Dollo, 1909, Proc.Roy.Soc.Edinburg, 29(4):316-26 (off Coat's Land, Antarctica; 71°50'S, 23°30'W; 0 to 1 829 m).

Synonyms : None

FAO Names : En - Dogtooth grenadier; **Fr** - Grenadier dente; **Sp** - Granadero dentón.



(after Regan, 1913)

Fig. 506

Diagnostic Features : Head profile rounded, without a protruding snout; orbits small, less than 15 % of head length. First dorsal fin with a rudimentary ray followed by a long smooth spinous ray and 8 or 9 segmented rays; pectoral fin with a splintlike uppermost ray and 14 to 16 normal rays; pelvic fin small, with 7 or 8 rays. Small, rather deciduous scales bearing 1 to 3 divergent rows of small, needlelike spinules uniformly covering almost all of body; scales absent over most of snout and in wide patches on head surrounding large pores of sensory lateralis system; a few small patches of scales between and anterior to first and second branchiostegal rays. Pyloric caeca rather long and slender, about 9 or 10. **Colour:** overall dark brown to brownish black.

Geographical Distribution : Circumpolar in Southern Ocean, extending north of Convergence in some areas (Fig. 507).

Habitat and Biology : Bathypelagic in midwaters of about 500 to 3 800 m, but most common in about 1 000 to 2 000 m depth.

Size : To 50 cm total length.

Interest to Fisheries : A common species in deep Antarctic midwaters, but so far not of commercial interest.

Literature : Dollo (1909); Regan (1913); Marshall (1964).

Remarks : The enlarged teeth and bathypelagic lifestyle are shared amongst grenadiers only with ***Odontomacrurus murrayi*** Norman, 1939, but that species has a small fossa of the light organ between the pelvic fin bases and anus well removed from anal fin origin, usually closer to pelvic bases.

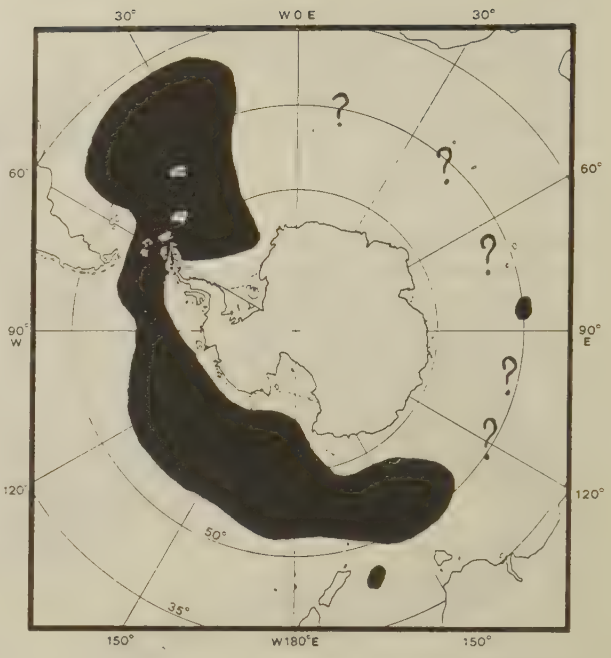


Fig. 507

Hymenocephalus Giglioli, 1882

MACROUR Hym

Genus with Reference : ***Hymenocephalus*** Giglioli, 1882, Nature (Lond.), 199 (type species ***Hymenocephalus italicus*** Giglioli, 1884, by monotypy).

Synonyms : Mystaconurus Günther, 1887, Rep.Sci.Results CHALLENGER Exped., 22 (Zool.):124 (as subgenus of ***Macrurus***) (type species ***Hymenocephalus italicus*** Giglioli, 1884, by subsequent designation of Jordan & Evermann, 1898:2580).

Diagnostic Features : Macrourines with 7 branchiostegal rays. Head large, cavernous; head covering thin or membranous; mouth large, subterminal to almost terminal; gill openings and outer gill slit rather wide; rakers numerous, usually more than 18 total on inner series of first arch. First dorsal fin with a smooth spinous ray. Anus usually immediately before anal fin origin. Striae, consisting of fine parallel black lines over silvery ground on isthmus, shoulder girdle, and chest. Light organ tubular; 2 lenslike windows, one before pelvic fin bases, the other before anus. Scales large, deciduous; scales with short fine spinules, these obsolescent in some species. Retia mirabilia and gas glands 2.

Habitat, Distribution and Biology: Worldwide in tropical seas except continental margin of eastern Pacific, where only a single individual has been reported from midwaters off Peru. Benthopelagic (occasionally bathypelagic) in about 300 to 900 m depth.

Size : To about 25 cm total length, but most species less than 20 cm.

Interest to Fisheries : Commonly taken by trawls in upper continental slope and shelf of most tropical seas, but the small adult size makes the species of little fisheries interest.

Literature : Gilbert & Hubbs (1920); Okamura (1970a, b); Marshall (1973); Iwamoto (1979).

Remarks : The genus constitutes a well-defined monophyletic unit whose origins may lie along the basal levels of the Macrourinae. Gilbert & Hubbs (1916) have noted its similarities to the bathygadines, and this relationship has been supported by Okamura's (1970b) studies of different structures and organ systems. The reasons for treating ***Hymenogadus*** and ***Spicomacurus*** as subgenera are given in Iwamoto (1979). The three taxa are readily distinguished by characters given in the key, which is modified from that of Gilbert & Hubbs (1920:520).

Key to Species of the genus *Hymenocephalus* (modified from Gilbert & Hubbs, 1920):

1a. Second dorsal spine weakly denticulate (Fig. 508) .... Subgenus ***Hymenogadus***

2a. Striations on sides of isthmus well developed (Fig. 508); barbel more than 2/3 of orbit diameter; inner gill rakers on first arch 0 to 4 + 11 to 15 (Fig. 509) (Atlantic, Western Indian Ocean, Japan, the Philippines) .... ***H. gracilis*** (Fig. 508)

2b. Striations on sides of isthmus obsolescent; barbel about half orbit diameter; inner gill rakers on first arch about 10 on lower limb (Hawaiian Islands) .... ***H. tenuis***

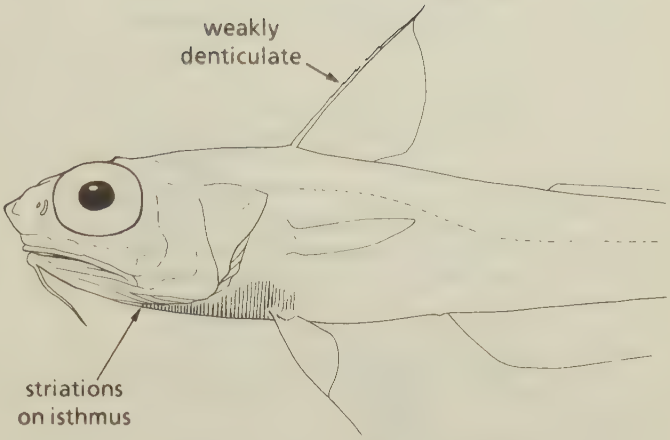
1b. Second dorsal spine wholly smooth

3a. Snout with 3 horizontal platelike processes; outer pelvic ray distally expanded (Fig. 510); 9 to 12 inner gill rakers on lower limb of first arch (Japan) .... Subgenus ***Spicomacrurus*** ***H. kuronumai*** (Fig. 510)

3b. Snout more normal, without platelike processes; outer pelvic ray with filamentous tip; 14 or more inner gill rakers on lower limb of first arch

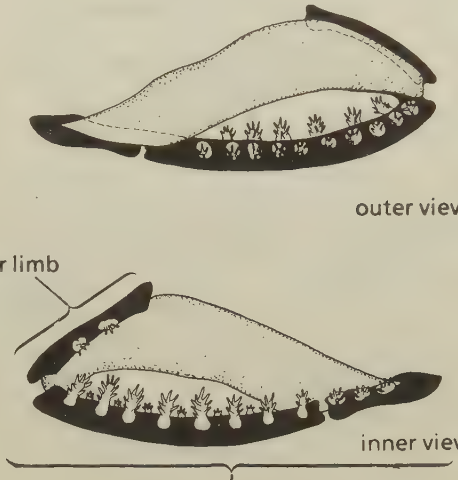
4a. Orbit very small, 4 to 5 times in head (Fig. 511) . Subgenus ***Papyrocephalus***

5a. Barbel small but present; pelvic fin with 7 or 11 rays


weakly denticulate
striations on isthmus

H. gracilis
(after Gilbert & Hubbs, 1920)

Fig. 508


outer view
upper limb
inner view
lower limb

first gill arch
H. gracilis
(from Okamura, 1970b)

Fig. 509

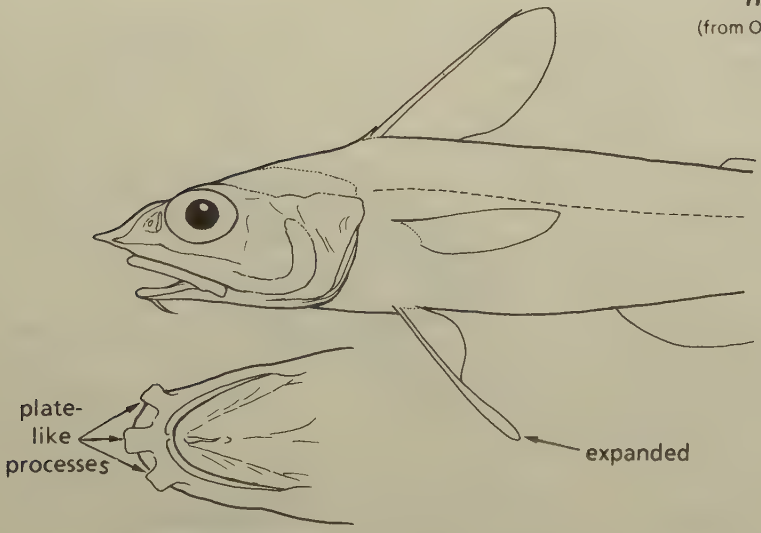


plate-like processes
expanded
underside of snout

H. kuronumai Fig. 510

6a. Pelvic fins with 7 rays (the Philippines) ..... ***H. barbatulus*** (Fig. 511)

6b. Pelvic fin with 11 rays (Japan) .... ***H. papyraceus*** (Fig. 512)

5b. Barbel absent; pelvic fin with 13 to 14 rays (Hawaiian Islands, W Atlantic) .... ***H. aterrimus*** Fig. 513)

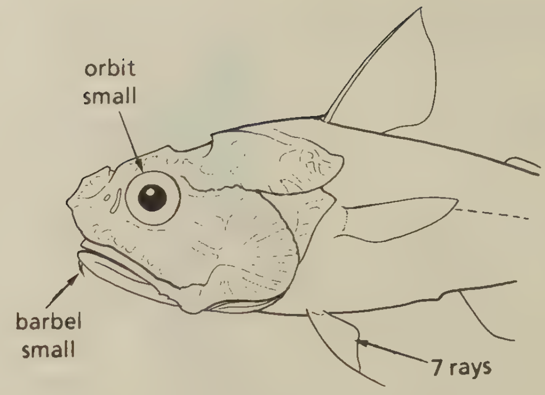
4b. Orbit large, 2.5 to 3.5 times in head (Fig. 514) ... Subgenus ***Hymenocephalus***

7a. Barbel longer than orbit diameter (Fig. 514); pelvic fins with 8 rays)

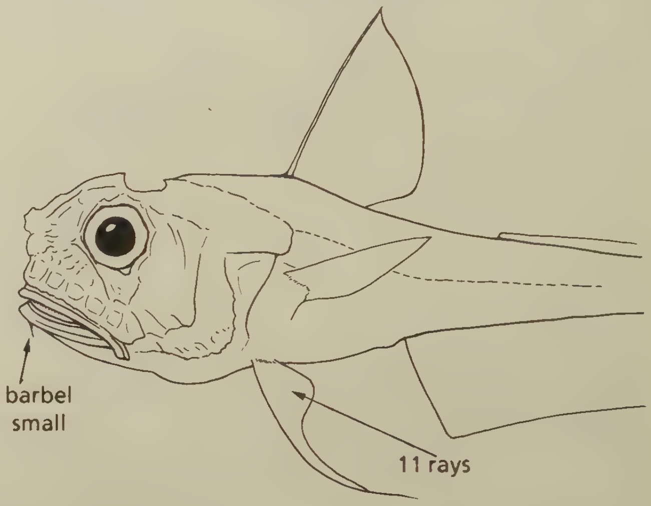
8a. Barbel about 2/3 head (Australia, Indonesia) .***H. longibarbis****

8b. Barbel less than 2/3 (Fig. 514) (Japan, the Philippines, South China Sea, Indonesia) .... ***H. longiceps**** (Fig. 514)

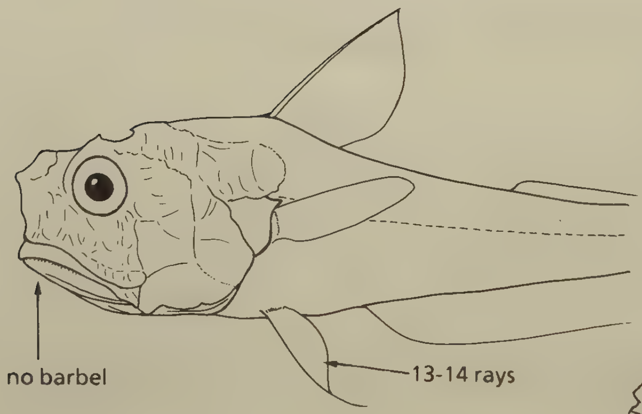
7b. Barbel much shorter than orbit diameter or absent; pelvic fins with 8 to 14 rays


orbit small
barbel small
7 rays

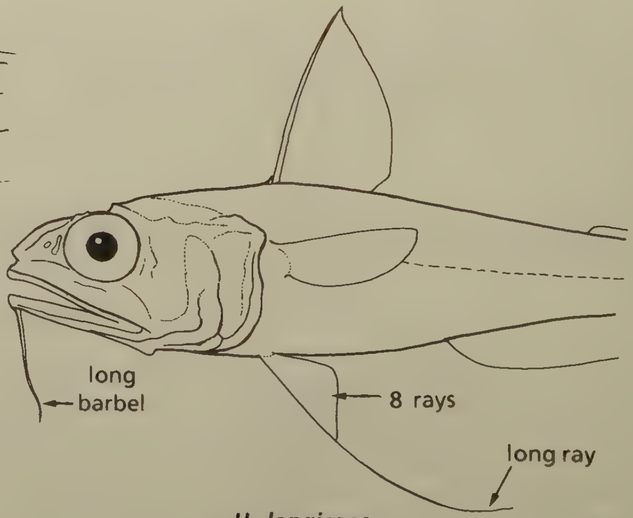
H. barbatulus Fig. 511


barbel small
11 rays

H. papyraceus
(after Jordan & Gilbert, 1904) Fig. 512


no barbel
13-14 rays

H. aterrimus
(after Marshall & Iwamoto in Marshall, 1973) Fig. 513


long barbel
8 rays
long ray

H. longiceps
(after Radcliffe, 1912) Fig. 514

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* *H. longibarbis* and *H. longiceps* are poorly differentiated. They may very well represent a single species

9a. Pelvic fins with 8 rays; rays greatly produced beyond anus, distal portion prominently black; no barbel (Fig. 515) (the Philippines) ... ***H. longipes*** (Fig. 515)

9b. Pelvic fins with 7 to 15 rays; rays little or not at all produced beyond anus, not black distally; barbel present or absent

10a. Pelvic fins with 7 or 8 rays (rarely 6 or 9)

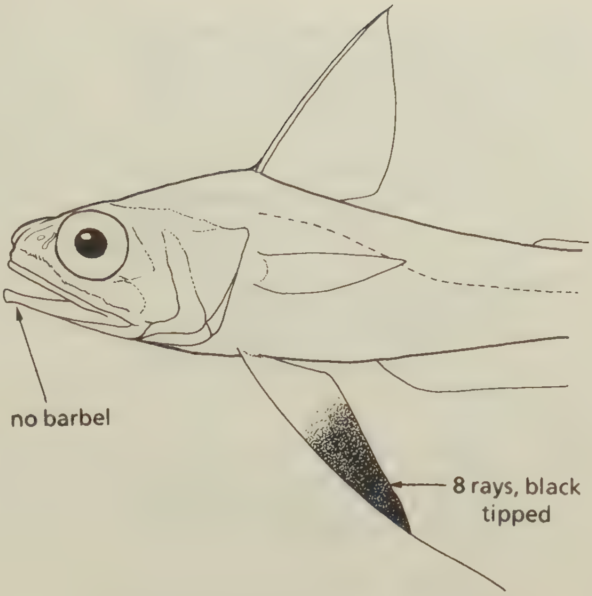
11a. Barbel absent or rudimentary (Indonesia) .... ***H. grimaldii*** (Fig. 516)

11b. Barbel present (Japan to Indonesia) .... ***H. striatissimus*** (Fig. 517)

10b. Pelvic fins with 10 to 15 rays

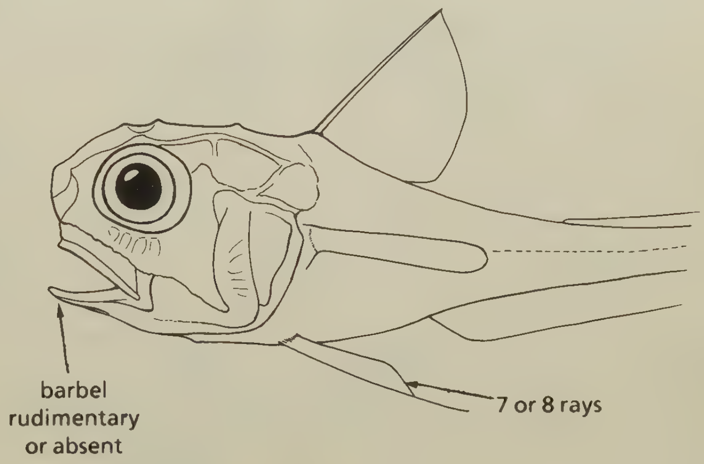
12a. Barbel minute or absent

13a. Snout short to moderate, slightly to notably protruding beyond mouth, about 2.2 to 2.5 times into postrostral length; orbits moderate to large, longest diameter usually oblique, about equal to or much shorter than length orbit to preopercle angle (Fig. 519)



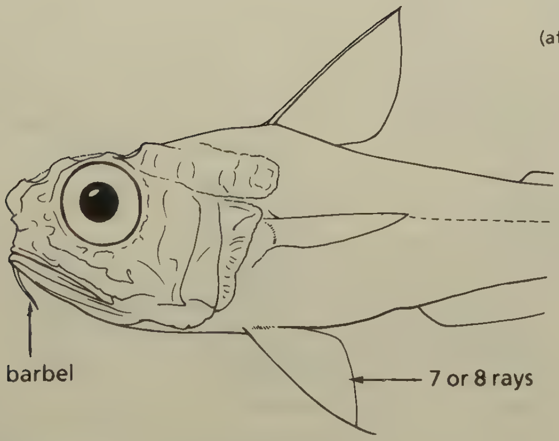
H. longipes
(after Radcliffe, 1912)

Fig. 515



H. grimaldii
(after Weber, 1913)

Fig. 516



H. striatissimus
(after Gilbert & Hubbs, 1920)

Fig. 517

14a. Greatest orbit diameter usually 1.4 to 1.6 times into distance orbit to preopercle angle; pelvic fins usually with 11 or 12 rays (sometimes 13)

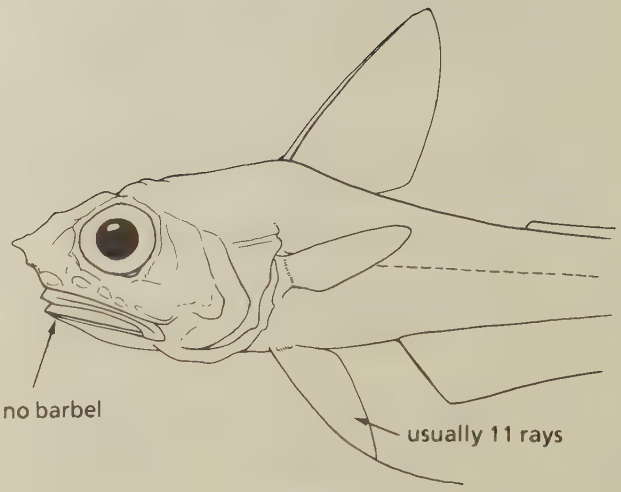
15a. Pelvic fins with 11 (sometimes 12) rays (Japan to South China Sea) .... ***H. lethonemus**** (Fig. 518)

15b. Pelvic fins with 12 (sometimes 11 or 13) rays (the Philippines, Indonesia) .... ***H. nascens**** (Fig. 519)

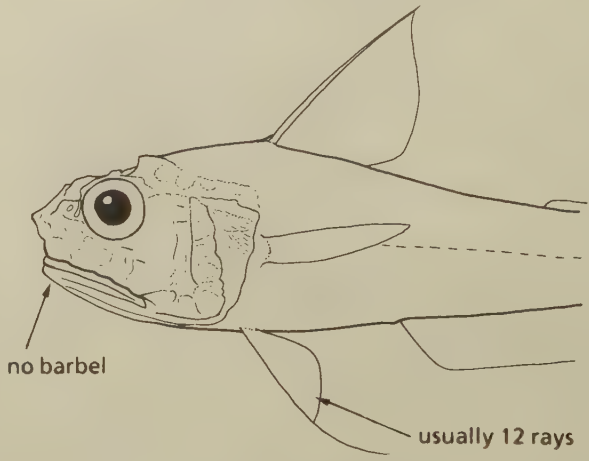
14b. Greatest orbit diameter usually 0.9 to 1.4 times into distance orbit to preopercle angle; pelvic fins usually with 13 to 15 (sometimes 12) rays

16a. Interorbital space 0.92 to 1.16 times into orbit (Western Atlantic) .... ***H. billsamorum*** (Fig. 520)

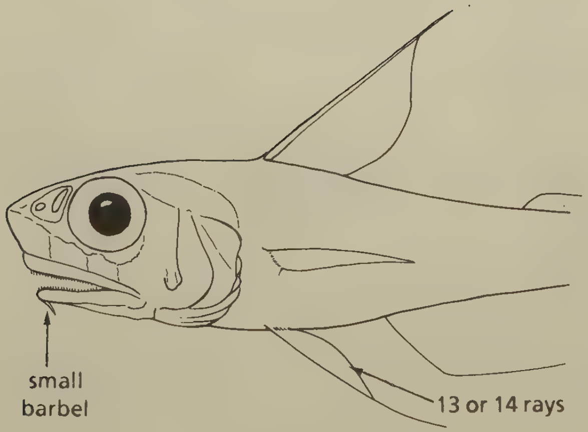
16b. Interorbital space 1.18 to 1.40 times into orbit (Hawaiian Islands) .... ***H. striatulus*** (Fig. 521)


no barbel
usually 11 rays

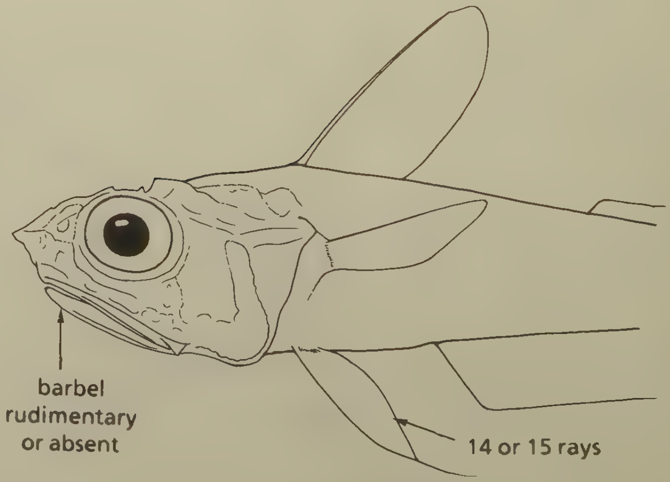
H. lethonemus
(after Jordan & Gilbert, 1904)
Fig. 518


no barbel
usually 12 rays

H. nascens
(after Gilbert & Hubbs, 1920)
Fig. 519


small barbel
13 or 14 rays

H. billsamorum
(after Marshall & Iwamoto in Marshall, 1973)
Fig. 520


barbel rudimentary or absent
14 or 15 rays

H. striatulus
(after Gilbert, 1905)
Fig. 521

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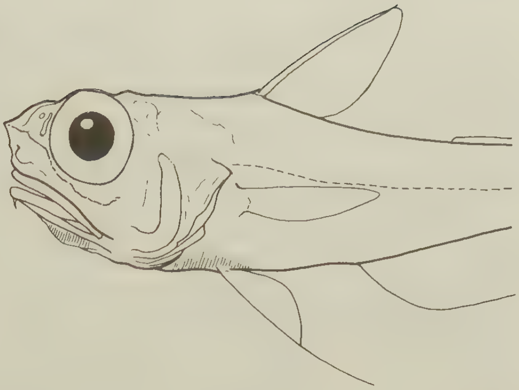
* Weber & de Beaufort (1929) synonymized ***H. nascens*** with ***H. lethonemus***, but Okamura (1970a) and Marshall & Iwamoto (1973:602) continued recognition of the former

13b. Snout very short, scarcely protruding beyond mouth, about 2.8 to 3.4 times into postrostral length of head; orbits large, circular or ellipsoidal in outline, their vertical diameter usually greatest (Fig. 522), about equal to length orbit to preopercle (Hawaiian Islands) .... ***H. antraeus*** (Fig. 522)

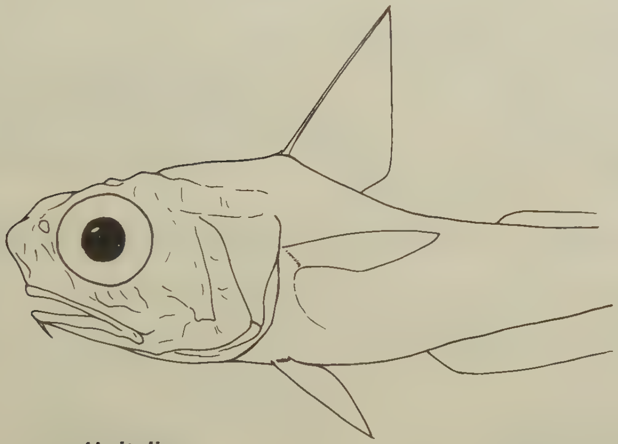


H. antraeus Fig. 522

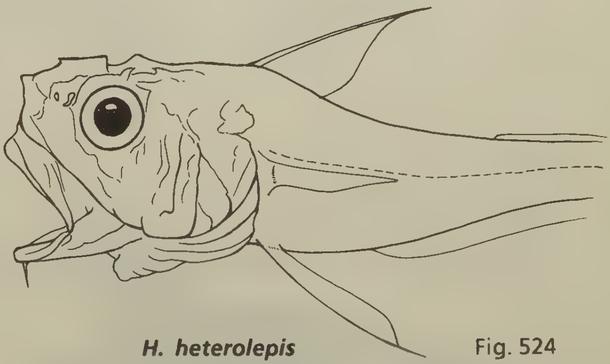
12b. Barbel small but distinctly developed, more than 7% of head length

17a. Orbit 2.5 to 3.3 times in head length; its length about equal to or greater than interorbital width (Atlantic) .... ***H. italicus**** (Fig. 523)

17b. Orbit diameter about 3.5 times in head length, about 5/6 of interorbital width (Indian Ocean) .... ***H. heterolepis**** (Fig. 524)



H. italicus
(after Parr, 1946) Fig. 523



H. heterolepis
(after Alcock, 1899) Fig. 524

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* ***H. italicus*** and ***H. heterolepis*** may also be synonyms

List of Species :

Subgenus ***Hymenocephalus***

Hymenocephalus (H.) antraeus Gilbert & Cramer, 1897
Hymenocephalus (H.) billsamorum Marshall & Iwamoto, 1973
Hymenocephalus (H.) grimaldii Weber, 1913
Hymenocephalus (H.) heterolepis Alcock, 1889
Hymenocephalus (H.) italicus Giglioli, 1884
Hymenocephalus (H.) lethonemus Jordan & Gilbert, 1904
Hymenocephalus (H.) longibarbis Günther, 1887
Hymenocephalus (H.) longiceps Smith & Radcliffe, 1912
Hymenocephalus (H.) longipes Smith & Radcliffe, 1912
Hymenocephalus (H.) nascens Gilbert & Hubbs, 1920
Hymenocephalus (H.) striatissimus Jordan & Gilbert, 1904
Hymenocephalus (H.) striatissimus aeger Gilbert & Hubbs, 1920
Hymenocephalus (H.) striatissimus hachijoensis Okamura, 1970
Hymenocephalus (H.) striatissimus torvus Smith & Radcliffe, 1912
Hymenocephalus (H.) striatulus Gilbert, 1905

Subgenus ***Hymenogadus*** Gilbert & Hubbs, 1920

Hymenocephalus (H.) gracilis Gilbert & Hubbs, 1920
Hymenocephalus (H.) tenuis Gilbert & Hubbs, 1917

Subgenus ***Papyrocephalus*** Gilbert & Hubbs, 1920

Hymenocephalus (P.) aterrimus Gilbert, 1905
Hymenocephalus (P.) barbatulus Gilbert & Hubbs, 1920
Hymenocephalus (P.) papyraceus Jordan & Gilbert, 1904

Subgenus ***Spicomacrurus*** Okamura, 1970

Hymenocephalus (S.) kuronumai Kamohara, 1938

Hymenocephalus italicus Giglioli, 1884

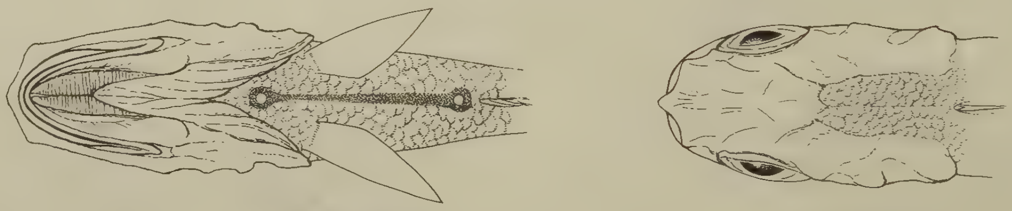
Fig. 525

MACROUR Hym 1

Scientific Name with Reference : ***Hymenocephalus italicus*** Giglioli, in Giglioli & Issel, 1884, Pelagos, saggi sulla vita et sui prodotti del mare Genova, 228, fig. (off Sicily and Sardinia, 508 and 823 m).

Synonyms : ***Malacocepahlus laevis*** -- Giglioli, 1882 (name only; non Lowe, 1874); ***Macrurus (Mystaconurus) italicus*** -- Günther, 1887; ***Macrurus italicus*** -- Collett, 1896.

FAO Names : En - Glasshead grenadier.



underside

top of head

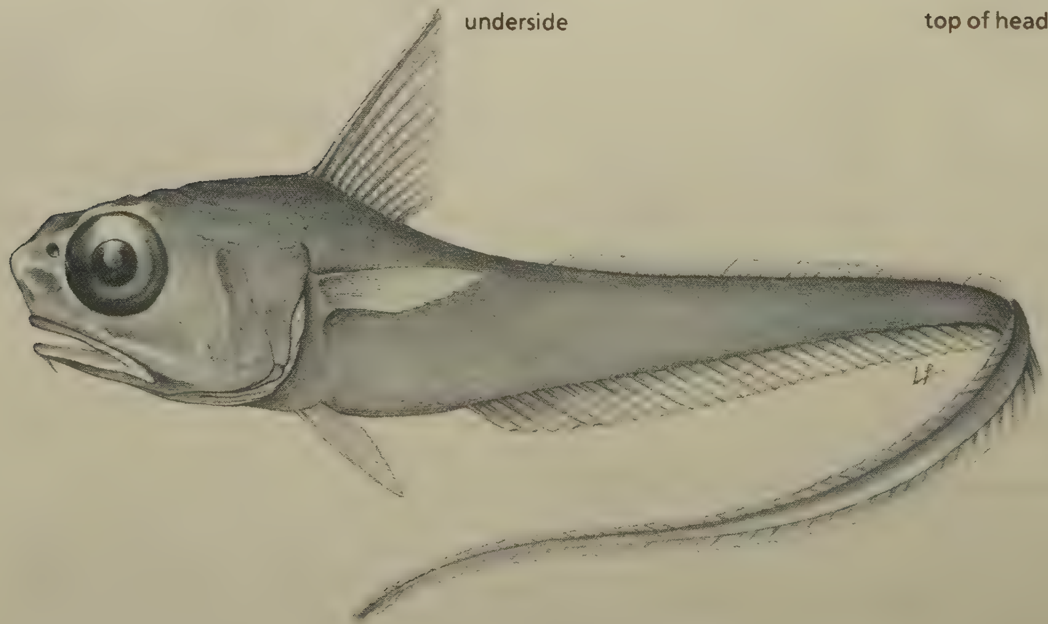


Fig. 525

Diagnostic Features : Orbits large, about equal to or greater than interorbital width, about 3 times into head length; barbel small but distinctly developed, its length about equal to pupil diameter, 10 to 15% of head length; outer gill rakers on first arch 4 or 5 + 19 to 21 (21 to 25 total); on second arch 4 or 5 + 18 to 22. Spinous second ray of first dorsal fin smooth, followed by 9 to 12 (usually 10 or 11) segmented rays; pectoral fin rays i13 to i16; pelvic fin rays 10 to 12, usually 11. Lenslike swellings of anterior and posterior dermal windows of light organ small but distinct. Pyloric caeca short, thick, 13 to 15 total.

Geographical Distribution : Throughout most of the warm-water Atlantic, from Portugal to Angola and in the Mediterranean in the east, and the Florida Straits through the Gulf of Mexico and Caribbean Sea to northern Brazil in the west (Fig. 526).

Habitat and Biology : Benthopelagic in about 100 to 800 m, but most common at depths less than 500 m. Feeds predominantly on pelagic copepods, to a lesser extent on euphausiids and gammarian amphipods, and to a minor extent on shrimps, ostracods, cumaceans, other small crustaceans, and small fish.

Size : To about 20 cm total length.

Interest to Fisheries : A common species often trawled in large numbers, but due to its small size it is not of significant interest to fisheries.

Local Names: JAPAN: Itaria-sujidara.

Literature : Parr (1946); Iwamoto (1970); Marshall & Iwamoto (in Marshall, 1973).

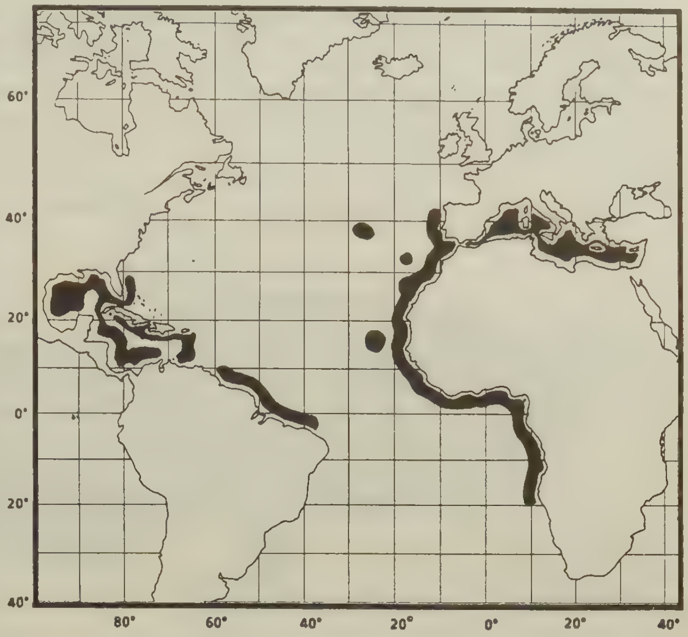


Fig. 526

Remarks : ***Hymenocephalus heterolepis*** from the Indian Ocean has been placed in the synonymy of ***H. italicus*** by Marshall & Iwamoto (1973), but the author's examination of specimens from the Andaman Sea suggests that the former species should be recognized based on differences in the relative dimensions of the orbit and interorbital space (see key).

Lepidorhynchus Richardson, 1846

MACROUR Lep

Genus with Reference : ***Macrourus*** vel ***Lepidorhynchus***, 1846, Zool.Voy.H.M.S.'Erebus' and 'Terror', 2:537 (type species ***Macrourus*** vel ***Lepidorhynchus denticulatus*** Richardson, 1846, by monotypy).

Synonyms : ***Optonurus*** Günther, 1887.

This genus includes a single species.

Lepidorhynchus denticulatus Richardson, 1846

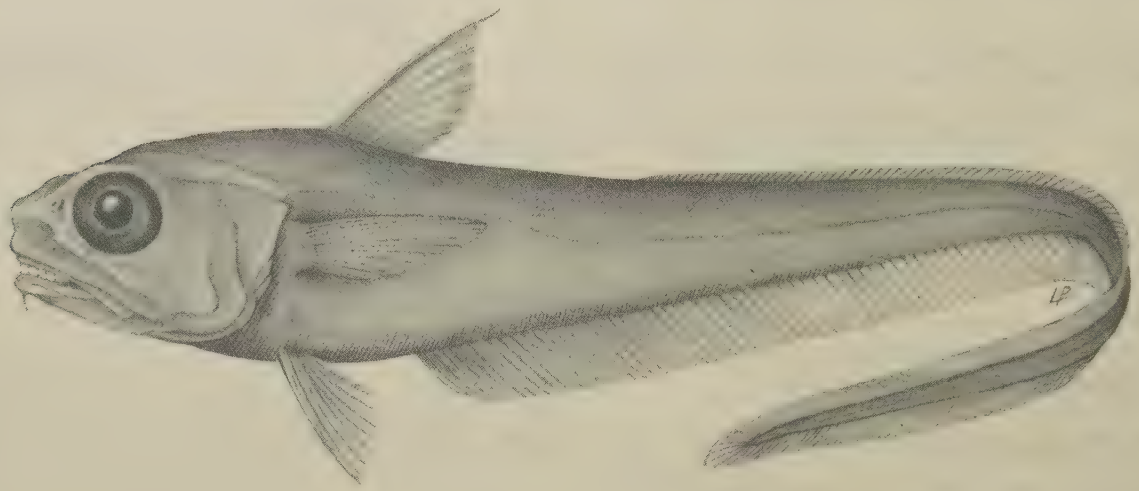
Fig. 527

MACROUR Lep 1

Scientific Name with Reference : ***Macrourus*** vel ***Lepidorhynchus denticulatus***, 1846, Zool.Voy.H.M.S. 'Erebus' and 'Terror', 2:53, pl. 32, figs 1-3 (South Australia).

Synonyms : ***Coryphaenoides denticulatus*** - Günther, 1862; ***Macrurus (Optonurus) denticulatus*** - Günther, 1887; ***Optonurus denticulatus*** - Gilbert & Hubbs, 1916; ***Lepidorhynchus denticulatus*** - Phillipps, 1927.

FAO Names : En - Thorntooth grenadier.



(after McCulloch, 1926)

Fig. 527

Diagnostic Features : A macrourine with 6 branchiostegal rays. Head ridges scarcely developed; no stout modified scales; premaxillary teeth in broad bands with outer row enlarged; mandibular teeth enlarged, in 1 row, slightly smaller and closer set than in premaxillary teeth; jaws essentially terminal, long, reaching to below posterior 1/3 of orbit diameter. Small tubercular gill rakers present on outer series of first arch; about 16 in inner series. First dorsal fin spine smooth. Pelvic fin rays 8 or 9. Anus at anal fin origin. Ventral striae consisting of alternate black and silvery lines along ventral aspects of body and tail (shoulders, isthmus, ventrally on abdomen, ventrally immediately above anterior half of anal fin). A small naked fossa of light organ adjacent to anus. Scales densely covered with lanceolate spinules arranged in quincunx or convergent rows. Retia mirabilia 9.

Geographical Distribution : Southern Australia and New Zealand (Fig. 528).

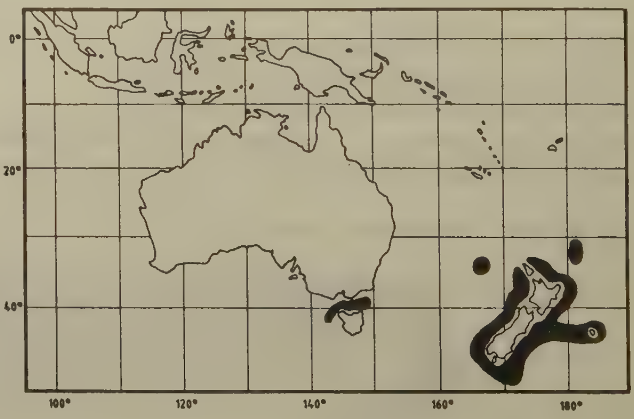


Fig. 528

Habitat and Biology : Benthopelagic, in 180 to 1 000 m, but most frequent at 270 to 450 m.

Size : To 55 cm total length.

Interest to Fisheries : According to Last et al. (1983:245), the species is the most abundant whiptail found off Tasmania "where it is frequently caught by the tonne as a large part of the bycatch of trawlers. Appears to be an important prey item for the more economically important blue grenadier".

Literature : Marshall (1973); McCann & McKnight (1980); Last et al. (1983).

Local Names : AUSTRALIA: Javelin fish, Toothed whiptail.

Macrourus Bloch, 1786

MACROUR Macr

Genus with Reference : ***Macrourus*** Bloch, 1786, Naturgeschichte der auslandischen Fische, Pt. II:150, pl. 177 (type species ***Coryphaena rupestris*** Fabricius, 1780 [non ***Coryphaenoides rupestris*** Gunnerus, 1765], by monotypy).

Diagnostic Features: Head large, broad, its depth 4.2 to 4.8 times in total length; snout rounded to bluntly pointed, with a stout modified spinous scale at tip; a strong, suborbital ridge that extends posteriorly onto preopercle, ending in a sharp point; orbit diameter about 1/3 of head length; mouth subterminal, jaws extend beyond vertical through midorbit; outer gill rakers on first arch absent; branchiostegal rays 6. Teeth small, in moderate to broad bands in premaxilla, none much enlarged, the bands tapering posteriorly and ending well short of rictus; mandibular band about 3 or 4 teeth wide at symphysis, narrowing to 1 row posteriorly and extending to about end of rictus. A serrated spinous dorsal fin ray; pelvic fin rays usually 8 or 9. Anus at anal fin, no light organ; swimbladder shallowly bilobed anteriorly, with 4 retia mirabilia. Body scales with an enlarged median row of spinules flanked by parallel rows of much smaller spinules.

Habitat, Distribution and Biology: A small, benthopelagic group of four upper- to middle-slope species confined to cold temperate and polar waters of the North and South Atlantic and in the Southern Ocean. Depth range from about 200 m to more than 3 000 m. Temperature preferences usually about 1 to 4 °C, although the Antarctic roughhead, ***M. whitsoni***, has been captured at temperatures slightly below 0 °C.

Size: Maximum size for all species probably near to, or exceeding 100 cm total length.

Interest to Fisheries: Important food fishes in the North Atlantic and off the Patagonian coast of Argentina. Apparently, the North Atlantic stocks of the roughhead grenadier are harvested primarily by vessels of the Soviet Union, German Democratic Republic, and Poland. With the reduced availability of the more desirable roundnose grenadier (***Coryphaenoides rupestris***), the roughhead grenadier has been increasingly targeted. No catch statistics were available to the author.

Although little information was available to the author on the South Atlantic ***Macrourus*** fishery, it is known that Argentina is currently importing the granadero into the United States. Because of the apparent mixing of stocks of ***Macrourus holotrachys*** and ***M. carinatus*** on the Patagonian slope, and the difficulty of distinguishing the two, it is possible that both species are being harvested under the name granadero.

As with other grenadiers, most ***Macrourus*** are marketed as fillets or gutted and scaled, with head, tail, and fins removed. Because of the large head, the recovery rate for fillets is less than 20%. The flesh of ***Macrourus*** is excellent: white, firm, and with a mild or little flavour.

Literature: Bigelow & Schroeder (1953); Makushok (1972); Marshall (1973); Trunov & Konstantinov (1986).

Remarks: The taxonomic status of the southern hemisphere species has been confused because of the difficulty of differentiating the three species, and the paucity of comparative material. After a detailed study of 47 specimens from the Antarctic, South Georgia, the Falklands/Malvinas, and Argentine Patagonia, Makushok (1972) found no specific differences between ***Macrourus whitsoni***, ***M. carinatus***, and ***M. holotrachys***, but he refrained from synonymizing the three because he had not examined the types. Marshall (1973), in his key to the species, recognized ***M. whitsoni***, ***M. berglax***, and ***M. holotrachys***, sinking ***M. carinatus*** into the synonymy of ***M. holotrachys***. Iwamoto & Geistdoerfer (1985) included ***M. carinatus*** and ***M. whitsoni*** in ***M. holotrachys***. Iwamoto (1986) later suggested that ***M. whitsoni*** "...may be another synonym."

Trunov & Konstantinov (1986) examined 119 specimens collected by Soviet vessels in 1975 at 7 stations on the Atlantic Patagonian slope and clearly demonstrated the presence of two species there: ***M. holotrachys*** (of which they had 71 specimens from 7 localities) and ***M. carinatus*** (48 specimens from 2 localities). The 2 stations at which the species were collected together were in depths of 300-330 and 650 m. The characters they used to distinguish the two species show some variation and overlap, but are effective when used in combination. The absence, or virtual absence, of squamation on the underside of the head is probably the most effective means of separating specimens of ***M. holotrachys*** from specimens of ***M. carinatus*** and ***M. whitsoni***, but problems arise when scales get sloughed off (which happens frequently in trawled specimens). Although the authors did not treat ***M. whitsoni***, that species is readily distinguished from the other two by its smaller, more delicate scales, its generally deeper habitat, and its distribution, which is generally confined to inside the Antarctic Convergence.

During the present author's visit to the Zoological Institute in Leningrad in 1988, Dr. Trunov generously provided useful information on differences between the three species. The key given below is adapted from one provided by Dr. Trunov, who will use it in a forthcoming publication treating the genus on a broader scale. His original key has been altered here by placing ***M. berglax*** in the first couplet, because the few specimens of that species the present author has examined, showed a virtual absence of scales on the underside of head. That character and others used must, however, be more carefully checked with adequate specimen series.

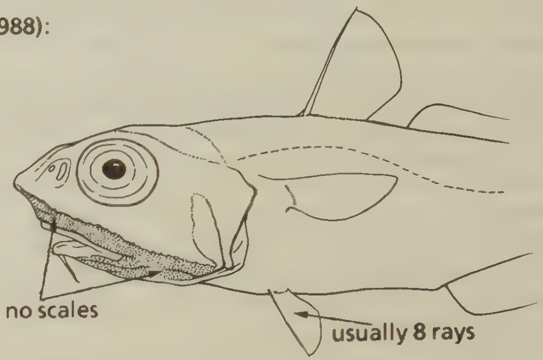
Key to Species (Adapted from key provided by I.A. Trunov, July 1988):

1a. Underside of head without scales, or if present, only 1 to 3 above corner of mouth (Figs 529, 530 a)

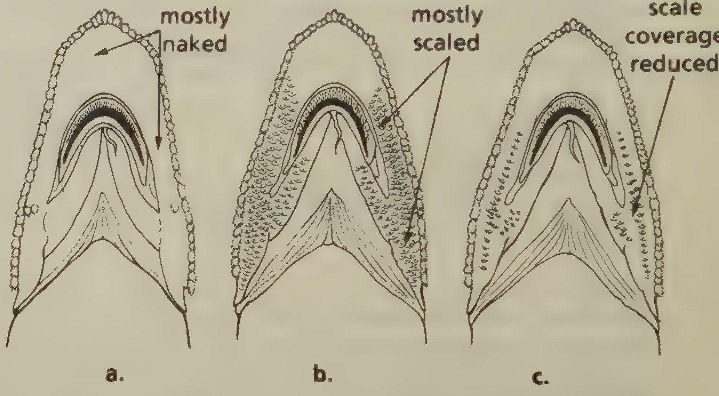
- **2a.** Pelvic fin rays usually 8; pyloric caeca about 20 .... ***M. berglax*** (North Atlantic) (Fig. 529)
- **2b.** Pelvic fin rays usually 9; pyloric caeca 8 to 16 .... ***M. holotrachys*** (South Atlantic (Argentina)) (Fig. 531)

1b. Scales usually present between suborbital ridge and jaws, and on underside of lower jaw (scales sometimes small and thin, and scarcely visible without magnification) (Figs 530b, c)

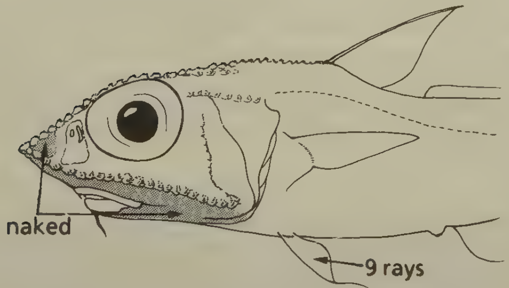
- **3a.** Scales in oblique rows between anal fin origin and lateral line more than 27; interorbital space 1.1 to 1.6 times (1.7 to 1.9 in small specimens) into orbit; length of 1st gill slit usually 1.4 to 1.5 times length of last slit .... ***M. whitsoni*** (Southern Ocean) (Fig. 532)
- **3b.** Scales in oblique rows between anal fin origin and lateral line fewer than 27; interorbital space 1.5 to 2.3 times into orbit; 1st gill slit about equal to or slightly longer than last slit .... ***M. carinatus*** (South Atlantic) (Fig. 533)



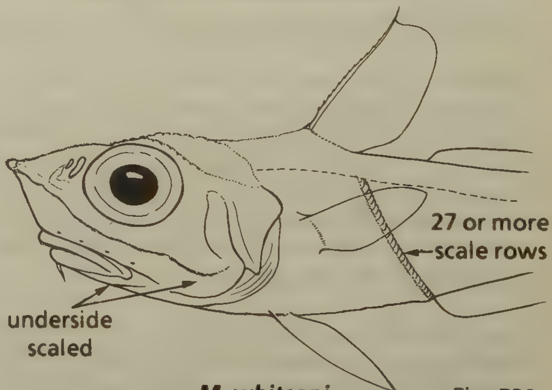
M. berglax Fig. 529
(after Goode & Bean, 1896)



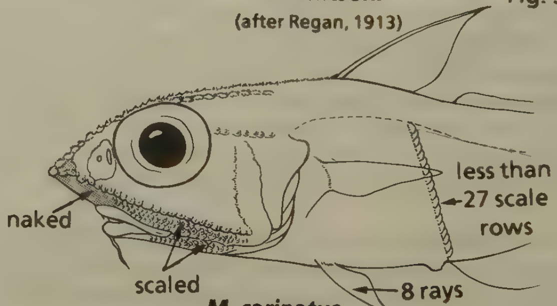
M. holotrachys ***M. carinatus*** Fig. 530
underside of head
(after Trunov & Konstantinov, 1986)



M. holotrachys Fig. 531
(after Trunov & Konstantinov, 1986)



M. whitsoni Fig. 532
(after Regan, 1913)



M. carinatus Fig. 533
(after Trunov & Konstantinov, 1986)

List of Species of *Macrourus*

Macrourus berglax Lacepède, 1810
Macrourus carinatus (Günther, 1878)
Macrourus holotrachys Günther, 1878
Macrourus whitsoni (Regan, 1913)

Macrourus berglax Lacepède, 1810

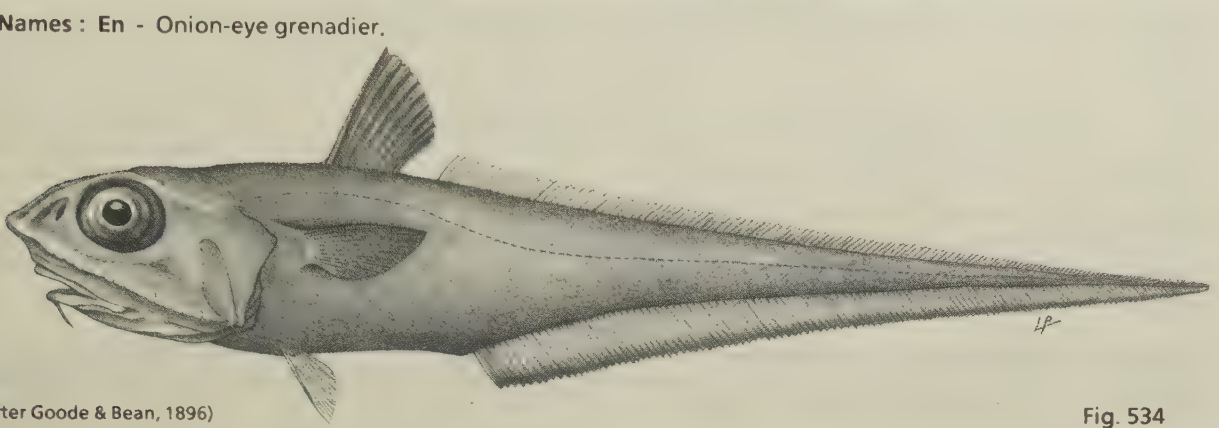
Fig. 534

MACROUR Macr 1

Scientific Name with Reference : ***Macrourus berglax*** Lacepède, 1810, Histoire Naturelle de Poissons, Paris, 3: 170, pl. 10 (fig. 1).

Synonyms : ***Coryphaena rupestris*** [non Gunnerus, 1765] -- Fabricius, 1780; ***Macrourus rupestris*** [non Gunnerus, 1765] -- Bloch, 1786; ***Macrurus fabricii*** Sundevall, 1842; ***Macrurus holotrachys*** [non Günther, 1887] -- Collett, 1896; ***Macrourus berglax*** -- Goode & Bean, 1896; ***Coryphaenoides (Macrourus) berglax*** -- Collett, 1905.

FAO Names : En - Onion-eye grenadier.



(after Goode & Bean, 1896)

Fig. 534

Diagnostic Features : Body depth about 60 to 80% of head length; snout rather strongly pointed, preoral length 24 to 29% of head length; underside of head almost or entirely naked; mouth small, notably inferior, upper jaw 27 to 31% of head length; opercular region short, distance from orbit to angle of preopercle 32 to 35% of head length; outer gill slit 10 to 12% of head length, about equal to barbel length (which is 11 to 14%); gill rakers on first arch and inner series of second arch 8 to 10 total. First dorsal fin with 9 or 10 segmented rays, its height 48 to 56% of head length; second dorsal fin beginning well forward of origin of anal fin; pectoral fin rays i15 to i18, length of fin about 45 to 50% of head length; pelvic fins with 8 rays (rarely 7 or 9), the outermost ray 34 to 40% of head length. Pyloric caeca about 19 or 20. Scale rows below second dorsal fin origin 5.5 to 6.5. **Colour:** overall grey, darker ventrally on trunk; anal fin dark edged, first dorsal and pectoral fins dusky.

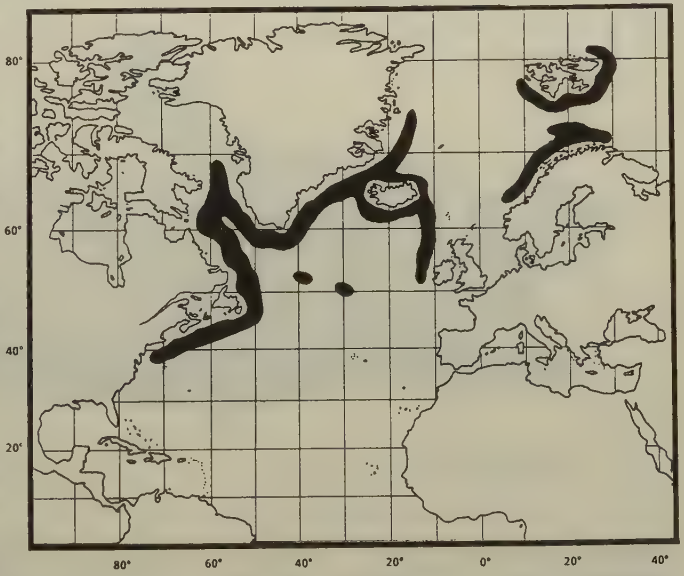


Fig. 535

Geographical Distribution : Temperate to arctic waters of the North Atlantic, from Norfolk Canyon (about 37° N off Virginia, USA) and Georges Bank north to Labrador, Davis Strait, eastern and western Greenland, Iceland, and from the Irish Atlantic slope north to the Faeroe Islands, Norwegian coast, to Spitzbergen, and into the Barents Sea north to 82°N (Fig. 535).

Habitat and Biology : Benthopelagic in about 100 to 1 000 m depth (greatest concentrations in about 300 to 500 m). Temperature preferences appear to range from about 1° to 4° C, although bottom temperatures below 0° C have been recorded at capture depths. Amphipods predominate in the diet, although polychaetes and various natant crustaceans are also important. Bivalves, isopods, echinoderms (notably ophiuroids), and ctenophores are important at times. Age determination studies have shown a life span of at least 25 years. Spawning probably takes place between late winter and early summer, and may vary with regions. Some evidence suggests a prolonged reproductive period. Yanulov (1962) counted 25 000 eggs in a female 70.5 cm long. Females mature at 42 cm, males at 53.7cm. The largest catches have been made off the Loften Islands, up to 1 440 kg/h of trawling, at 700 to 800 m depth.

Size : To more than 100 cm total length.

Local Names : CANADA: Onion eye, Roughhead grenadier; FRANCE: Grenadier berglax; GERMANY: Rauhköpfiger Grenadier-fisch; USA: Onion eye, Roughhead grenadier

Interest to Fisheries : One of two grenadiers actively targeted by fishermen in the North Atlantic. Catch statistics for the species are not separated from that of the roundnose (or rock) grenadier, ***Coryphaenoides rupestris***. Landings of grenadiers in the North Atlantic have shown a steady decline since the high in 1972 of more than 83 000 metric tons (to 3 587 metric tons in 1983). It is not known whether the decline is attributable to reduced stocks of the roundnose grenadier or to reductions in both species.

Literature : Parr (1946); Marshall (1973); Geistdoerfer (1979); Gordon (1979); Sahrhage (1986).

Macrourus carinatus (Günther, 1878)

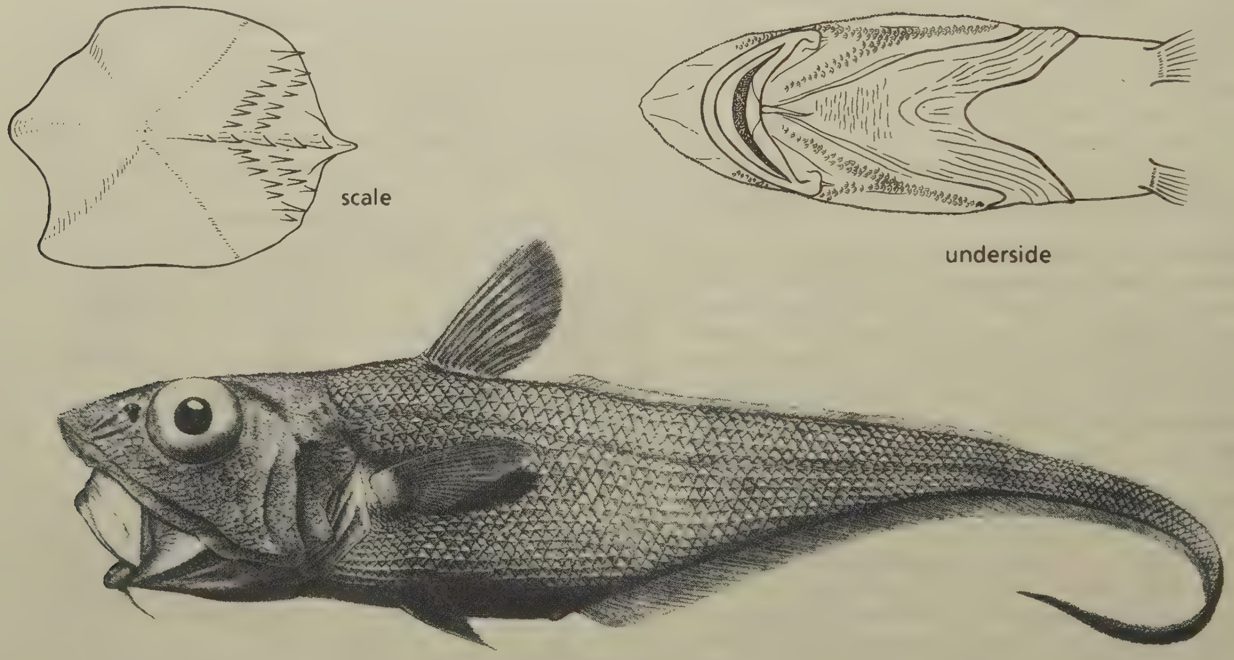
Fig. 536

MACROUR Macr 2

Scientific Name with Reference : ***Coryphaenoides carinatus*** Günther, 1878: 28, (near Prince Edward Island, 310 fm. Holotype: BMNH 1887.12.7.89).

Synonyms : ***Macrurus carinatus***: Günther, 1887; ***Macrourus holotrachys*** (nec Günther, 1878): Golovan and Pakhorukov, 1983; Trunov, 1982; Iwamoto and Geistdoerfer, 1985 (partim); Iwamoto 1986 (partim); ***Coryphaenoides holotrachys***: Norman, 1937 (non Günther, 1878).

FAO Names : En -



(from Günther, 1887)

Fig. 536

Diagnostic Features : Head 4.4 to 4.8 times in total length; snout 29 to 40% of head length; naked patches on dorsal surface of snout behind leading edges small; underside of head posterior to snout moderately to extensively scaled, but sometimes only a file or narrow band of small scales below suborbital and preopercular ridges, and posteriorly on lower jaw; orbit 31 to 46%, interorbital space 14 to 24%, and upper jaw 27 to 39% of head length; barbel 2.2 to 3.9, suborbital space 2.0 to 3.1 times in orbit; outer gill slit 9 to 14% of head length; inner gill rakers 8 to 11 total. First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays i17 to i20; pelvic rays 8 (rarely 9); dorsal interspace 4.5 to 7.2 in head length; origins of anal and second dorsal fin about on same vertical. Pyloric caeca 13 to 21. Scales below midbase of first dorsal fin usually 4.5 to 6.5; scale rows from lateral line to anal fin origin less than 27. **Colour:** medium brown to somewhat straw coloured; fins darker, blackish in some; dorsal and pelvic fins darker distally; mouth lining dark grey or brown.

Geographical Distribution : Subantarctic to temperate waters on both sides of South America, Falkland/Malvinas Islands, Discovery Tablemount and Meteor Seamount, South Africa, off Crozet and Prince Edward Island, and off New Zealand and Macquarie Island (Fig. 537).

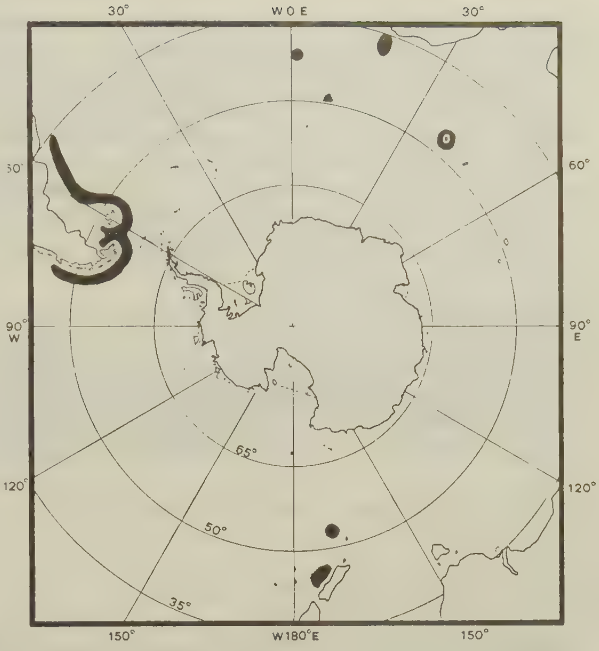


Fig. 537

Habitat and Biology : Apparently benthopelagic in about 300 to 1100 m depth, although it is most often taken between 500 and 800 m.

Size : To at least 87 cm, and probably more than 100 cm total length.

Interest to Fisheries : Abundant off the Patagonian coast, and perhaps elsewhere. Catches of the two Patagonian species of ***Macrourus*** are probably mixed; some are known to be exported to the United States.

Literature : Günther (1878, 1887); Makushok (1967); Barnard (1925); Trunov & Konstantinov (1986).

Remarks : According to Trunov & Konstantinov (1986) ***M. carinatus*** and ***M. holotrachys*** differ in: squamation on the underside of the head (more extensive in ***M. carinatus***); lunate areas behind the leading edges of the snout (broader, more naked in ***M. holotrachys***); pelvic fin rays (fewer in ***M. carinatus***, usually 8 compared with 9); pyloric caeca (more in ***M. carinatus*** 13 to 21 vs. 8 to 16); and relative positions of the origins of the second dorsal and anal fins (second dorsal in advance of anal in ***M. holotrachys***, above anal origin in ***M. carinatus***). The first character should be evaluated carefully in attempting to identify specimens, as considerable variation can be found. In some specimens of ***M. carinatus***, scales densely cover most of the underside, whereas in others, only a file or narrow patch of small thin scales can be found above the jaws.

Macrourus holotrachys Günther, 1878

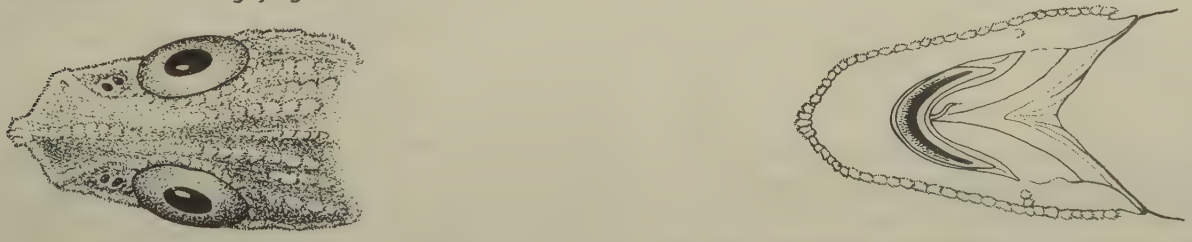
Fig. 538

MACROUR Macr 3

Scientific Name with Reference : ***Macrurus holotrachys*** Günther, 1878: 24 (east of mouth of Rio de la Plata, CHALLENGER sta. 320, 600 fm).

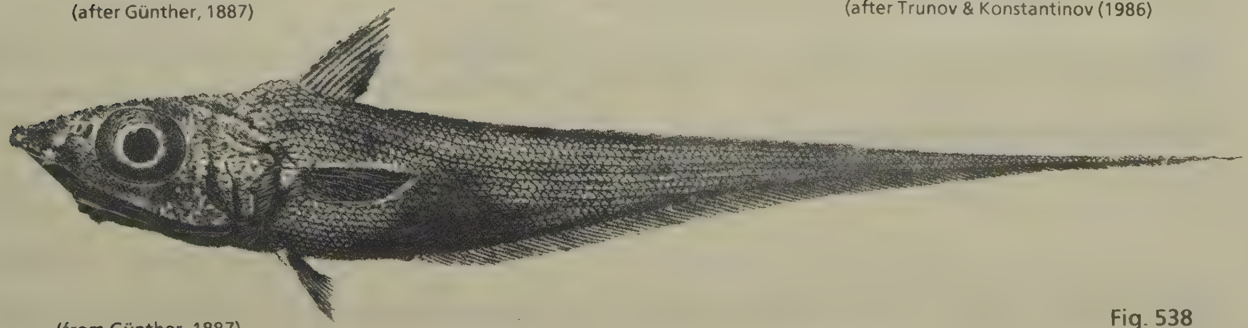
Synonyms : None

FAO Names : En - Bigeye grenadier.



top of head
(after Günther, 1887)

underside
(after Trunov & Konstantinov (1986)



(from Günther, 1887)

Fig. 538

Diagnostic Features : Head 4.4 to 4.6 times in total length; snout 29 to 37% of head length; upper side of snout with a broad naked patch on either side behind anterolateral margins; underside of head entirely naked, or at most, only 1 to 3 small scales just above corner of mouth; orbit 33 to 41%, interorbital width 16 to 21%, upper jaw 24 to 42% of head length; barbel 3.3 to 4.5, suborbital 2.4 to 2.5 times in orbit; outer gill slit 8 to 12% of head length; total inner gill rakers 8 to 11. First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays i17 to i19; pelvic rays 9 (rarely 8); interspace between dorsal fins 4.1 to 8.1 times in head length; origin of anal fin behind that of second dorsal, usually on a vertical below 2nd to 4th ray of second dorsal. Pyloric caeca 8 to 16. Scales below midbase of first dorsal fin usually 4.5 to 6.5; diagonal scale rows from anal fin origin to lateral line fewer than 27. **Colour:** light to medium brown or greyish brown; fins darker, especially distally; mouth and gill cavities dark.

Geographical Distribution : So far positively known only from the Patagonian slope from east of the Rio de la Plata to north of the Falkland/Malvinas Islands, and off Shag Rock west of South Georgia. It can be expected also on the west coast of Chile, but its presence there, as well as in other regions where it has been reported, must be confirmed (Fig. 539).

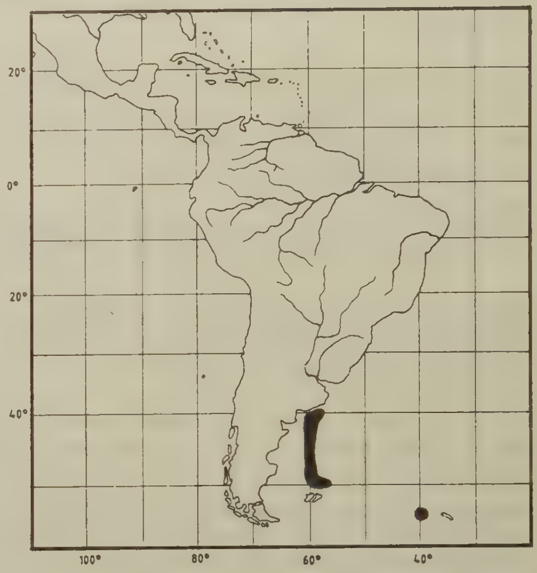


Fig. 539

Habitat and Biology : Benthopelagic from about 300 to more than 1 200 m depth.

Size : To more than 80 cm total length.

Interest to Fisheries : Of a large size and undoubtedly taken as part of the granadero catch off Argentina.

Local Names : ARGENTINA: Granadero; JAPAN: Patagonia-sokodara

Literature : Günther (1878, 1887); Trunov & Konstantinov (1986).

Remarks : See also Remarks section under ***M. carinatus***. ***Macrourus holotrachys*** has been reported numerous times from different localities, but the previous confusion with its close relative, ***M. carinatus***, leaves doubtful most of these identifications. These records should be rechecked to firmly establish the limits of its distribution.

Macrourus whitsoni (Regan, 1913)

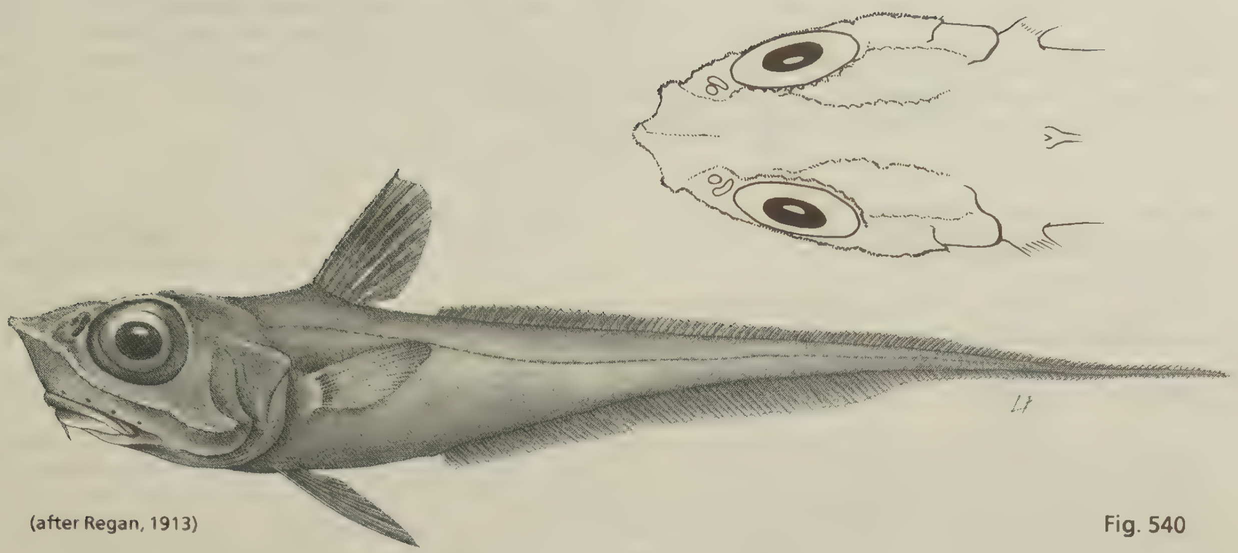
Fig. 540

MACROUR Macr 4

Scientific Name with Reference : *Chalinura whitsoni* Regan, 1913, Trans. Roy. Soc. Edinburgh 49 (pt. 2): 236, pl. 2, fig. 2 (off Coats Land, Antarctica; 71°22'S, 16°W; 2579 m).

Synonyms : *Coryphaenoides whitsoni* - Gilbert & Hubbs, 1916; ***Macrourus whitsoni*** - Makushok, 1967; ***Macrourus holotrachys*** (non Günther, 1878) - Iwamoto and Geistdoerfer, 1985 (partim).

FAO Names : En - Whitson's grenadier.



(after Regan, 1913)

Fig. 540

Diagnostic Features : Body depth about 65 to 90% of head length; snout usually somewhat rounded with a high dorsal profile in adults, but often with prominent tubercles at tip and lateral angles; preoral length 19 to 27% of head length; mouth rather large, lips thin, upper jaw 32 to 44% of head length; distance from orbit to angle of preopercle 34 to 44% of head length; underside of head generally covered with small scales below suborbital, preopercle, and posteriorly on mandible (but scales sparse on some individuals); outer gill slit 14 to 22% of head length, longer than barbel length (which is 7 to 15%); inner gill rakers on first and second arches 10 to 12 total (rarely 13). First dorsal fin with 8 to 11 (usually 9 or 10) segmented rays, its height about 55 to 65% of head length; second dorsal fin begins about over or slightly ahead of origin of anal fin; pectoral fin with a splintlike uppermost ray and 17 to 20 lower rays, its length about 50 to 60% of head length; outermost ray of pelvic fins usually about 45 to 60% of head length. Pyloric caeca 18 to 28 (in 11 specimens). Scale rows below second dorsal origin usually 6.5 to 7.5 (rarely 5.5). **Colour:** overall dark brown to swarthy in most individuals, but some are much paler; fins and lips blackish.

Geographical Distribution : Circumpolar in Antarctic waters; generally confined inside the Convergence except in the Falkland/Malvinas Islands area(Fig. 541).

Habitat and Biology : Benthopelagic from about 400 to 3 185 m depth (greatest concentrations in about 600 to 1 500 m). Remains of natant crustaceans (especially euphausiids), polychaetes, and fish (gonostomatids) have been found in the stomachs of three specimens examined.

Size : To more than 75 cm total length.

Interest to Fisheries : One of three ***Macrourus*** species in the southern hemisphere, all of which attain a large size and are taken, sometimes in large quantities, by commercial and research trawlers, especially in the Patagonian region of the South Atlantic. No catch statistics for any of the species were available to the present author, and it is not known if ***M. whitsoni*** is currently being exploited. Nakamura (1986) estimated the standing stock of ***M. whitsoni*** off the Patagonian shelf of Argentina at 624 000 metric tons, but it is probable that that figure applies to the two more-northern species, as the present author's specimen data suggest that ***M. whitsoni*** does not occur very far north of the Antarctic Convergence.

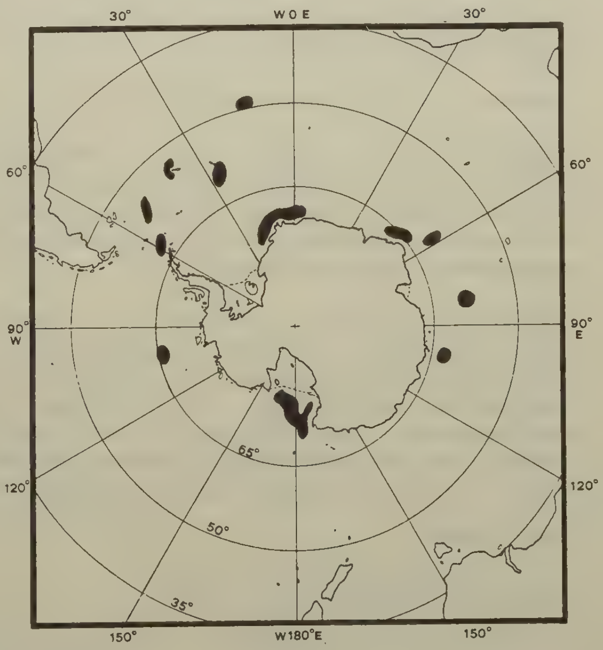


Fig. 541

Local Names : JAPAN: Yoroi-sokodara.

Literature : Regan (1913); Waite (1916); Norman (1937a, 1937b); Makushok (1967, 1972); Marshall (1973); Nakamura (1986).

Remarks : ***Macrourus whitsoni*** appears to be geographically and bathymetrically separated from its two northern congeners, ***M. carinatus*** and ***M. holotrachys***. ***M. whitsoni*** is generally confined to depths greater than about 500 m (usually between 600 and 1 500 m) within the Antarctic Convergence, whereas the other two species are most commonly captured around 300 to 800 m outside the Convergence. The species appear to overlap in their distributions, however, in the Falkland/Malvinas Islands, Burdwood Bank, and South Georgia. Feeds on pelagic crustaceans (especially euphausiids), small fish, and polychaetes.

Malacocephalus Günther, 1862

MACROUR Mal

Genus with Reference : ***Malacocephalus*** Günther, 1862, Cat. Fish. Brit. Mus., 4: 396 (as subgenus of ***Macrurus***) (type species ***Macrourus laevis*** Lowe, 1843, by monotypy).

Synonyms : None.

Diagnostic Features: Macrourines with 7 branchiostegal rays. Snout rounded, head laterally compressed, completely and uniformly covered with scales (except on lips, eyes around nostrils, and parts of gill and gular membranes); scale patches on branchiostegals; no coarsely modified tubercular or scutelike scales; suborbital region flat, lacking a raised longitudinal ridge; mouth large, upper jaw usually more than 45% of head length; gill rakers fewer than 16 on inner series of outer arch. Premaxillary teeth in 2 rows to a band, outer row notably enlarged and widely spaced; lower jaw teeth relatively few, widely spaced canines in 1 row. Second spinous ray of first dorsal fin smooth or serrated. Anus removed from anal fin origin, closer to pelvic fin insertion, situated at posterior end of an elongated oval to dumbbell-shaped area of naked black skin (periproct); a small round dermal window of light organ at anterior end of periproct, a second,larger bean-shaped window in a fossa between pelvic fin bases, separated from periproct by a shallow ridge of small scales. Retia mirabilia and gas glands 2; retia short, broad. Pyloric caeca numerous, multiply branching, 50 to 100 or more in distal count. Scales of body densely covered with small, fine, needle-like spinules giving a characteristic velvety texture to the surface.

Habitat, Distribution and Biology: Worldwide in tropical to warm-temperate seas. Benthopelagic in about 200 to 1 000 m depth, but most common in 300 to 700 m.

Size: To about 60 cm total length.

Interest to Fisheries: Often occurs in moderate to large quantities and forms part of the bycatch of trawlers fishing in upper continental-slope waters.

Literature: Parr (1946); Iwamoto (1970, 1979); Okamura (1970a, 1970b); Marshall (1973).

Remarks: The present author (Iwamoto, 1970) provided a key to the subgenera and 6 species of ***Malacocephalus***. The recent description of a 7th species, ***M. boretzi*** Sazonov, 1985, from the central Pacific, and the present author's discovery of other species from the Pacific and Indian oceans renders that key untenable. The intermediacy of several characters in ***M. boretzi*** clouds the distinction between the two ***Malacocephalus*** subgenera and also between ***Malacocephalus*** and ***Ventrifossa***.

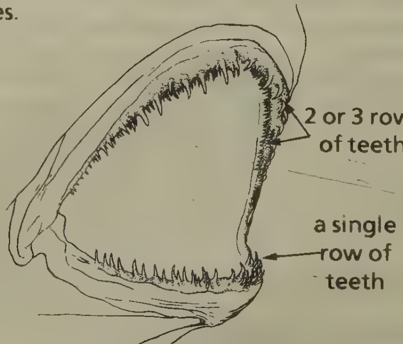
Some questions remain as to the status of the species ***M. nipponensis*** and ***M. hawaiiensis*** because of their close similarity to ***M. laevis*** -- it has been suggested that the 3 represent a single circumglobal species. The present author found the Atlantic and Indian Ocean populations to differ in one significant character from Pacific populations -- the scale count below the midbase of the first dorsal fin was 10.5 to 11.5 in the former and 8.0 to 9.5 in the latter. The scales appeared to be slightly larger and the spinules slightly longer in the Pacific population, but this was not quantified because of difficulties in making comparisons of these size-related features. Close comparisons of specimens from throughout the range may reveal other distinguishing features.

Key to Species

1a. Dorsal fin spine smooth.

2a. Lower jaw teeth in 2 irregular rows; pelvic fins with 8 rays .... ***M. boretzi***
(C. N. Pacific)

2b. Lower jaw teeth in 1 series (Fig. 542); pelvic fins with 9 rays



(from Iwamoto & Arai, 1987) Fig. 542

3a. Snout short, about 24% of head length, its tip on a horizontal through lower edge of pupil; preoral length 15% of head length; pectoral fins with 16 or 17 rays .... ***M. luzonensis*** (Philippines)

3b. Snout longer, 26% of head length or more; more pointed and higher, its bony tip on a horizontal through upper part of pupil; preoral length 16% of head length or more; pectoral fins usually with 18 to 22 rays

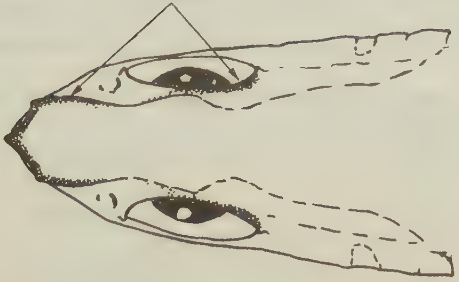
4a. Scales below midbase of first dorsal fin 10 or more .... ***M. laevis*** (Atlantic, Indian Ocean)

4b. Scales below midbase of first dorsal fin 8.0 to 9.5 (Pacific) .... ***M. nipponensis*** (Japan) ***M. hawaiiensis*** (Hawaii)

1b. Dorsal spine serrated

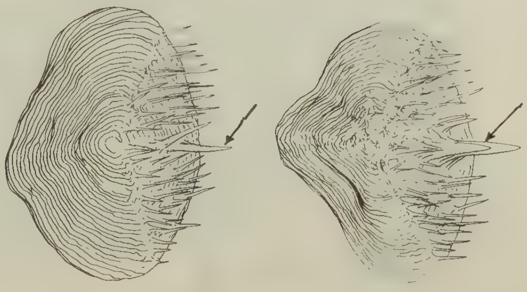
5a. Interorbital space usually 20 to 24% of head length. Scales below second dorsal fin lacking enlarged median spinules. Margins of orbits and leading edge of snout outlined in black (Fig. 543) .... ***M. occidentalis*** (Atlantic)

5b. Interorbital space 27 to 34% of head length. Scales below second dorsal fin with enlarged median spinules in adults (Fig. 544). No black margins on orbits or snout .... ***M. okamurai*** (Tropical W. Atlantic)



top of head

M. occidentalis Fig. 543



scales

M. okamurai Fig. 544

(from Iwamoto & Arai, 1987)

List of Species of *Malacocephalus*

Subgenus ***Malacocephalus***

Malacocephalus (M.) hawaiiensis Gilbert, 1905
Malacocephalus (M.) laevis (Lowe, 1843)
Malacocephalus (M.) luzonensis Gilbert & Hubbs, 1920
Malacocephalus (M.) nipponensis Gilbert & Hubbs, 1916

Subgenus ***Pawnurus***

Malacocephalus (P.) boretzi Sazonov, 1985
Malacocephalus (P.) occidentalis Goode & Bean, 1885
Malacocephalus (P.) okamurai Iwamoto & Arai, 1987

Malacocephalus laevis (Lowe, 1843)

Fig. 545

MACROUR Mal 1

Scientific Name with Reference : ***Macrourus laevis*** Lowe, 1843, Proc. Zool. Soc. Lond. 11:92

Synonyms : ***Malacocephalus laevis*** - Günther, 1862:397; ***Macrurus (Malacocephalus) laevis*** - Günther, 1887.

FAO Names : En - Softhead grenadier; **Fr** - Grenadier barbu; **Sp** - Abambolo de bajura.

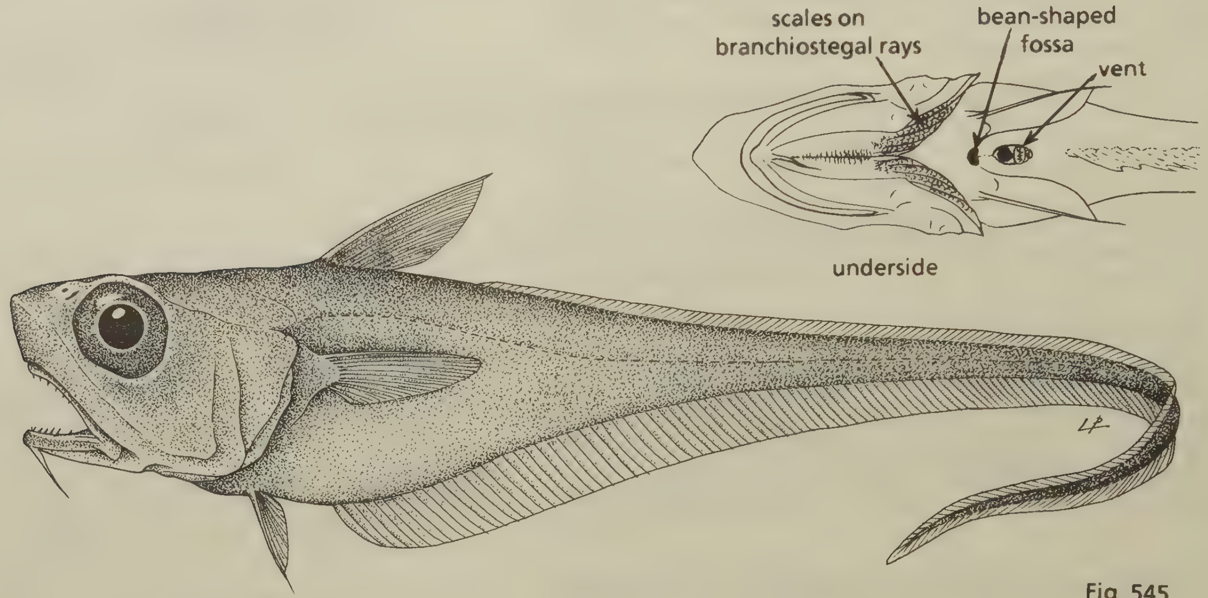


Fig. 545

Diagnostic Features : Interorbital width (usually 30 to 33% of head length) equal to or shorter than orbit diameter; snout 26 to 31% of head length; distance from orbit to preopercle angle 41 to 47% of head length. Two distinct rows of teeth on premaxillae; 1 wide-spaced row of canines on mandible. Usually a patch of scales on gular membrane; inner gill rakers on first arch 11 to 14 total. Dorsal fin spine smooth; first dorsal fin with 2 spines and 9 to 13 rays; pectoral fin rays i15 to i21.

Geographical Distribution : Warm waters of Atlantic and Indian Oceans; also possibly off Baja California (Fig. 546).

Habitat and Biology : Benthopelagic on continental slopes in depths of 200 to 1000 m, but most common in about 300 to 700 m.

Size : To about 52 cm total length.

Interest to Fisheries : Commonly taken as bycatch of bottom trawlers in many areas. Used mostly for fishmeal and oil. In the past, fishermen in the North Atlantic were reported to have used the luminescent excretion from the ventral light organ to enhance baits used for codfishing.

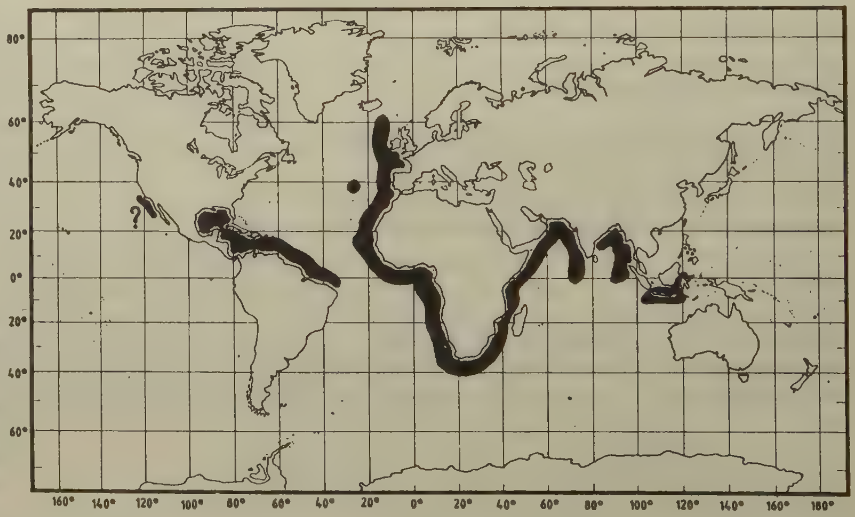


Fig. 546

Literature : Marshall (1973); Iwamoto (1970, 1979).

Remarks : The nominal Pacific species ***M. hawaiiensis, M. luzonensis***, and ***M. nipponensis*** are closely related to ***Malacocephalus laevis*** and may eventually prove to represent populations of that species. Differences between these nominal species have not been adequately defined. A comprehensive comparison of material from the Atlantic, Indian Ocean, and throughout the Pacific is needed.

Malacocephalus occidentalis Goode & Bean, 1885

Fig. 547

MACROUR Mal 2

Scientific Name with Reference : ***Malacocephalus occidentalis*** Goode & Bean, 1885, Proc. U.S. Natl. Mus. 8:597.

Synonyms : ***Lionurus (Nezumia) occidentalis*** -- Gilbert & Hubbs, 1916: 145; ***Chalinura occidentalis*** -- Goode & Bean, 1896: 413; ***Ventrifossa (Ventrifossa) occidentalis*** -- Gilbert & Hubbs, 1920: 544; ***Malacocephalus (Pawnurus) occidentalis*** -- Parr, 1946; ***Macruroplus violaceus*** [non Zugmayer, 1911] -- Cadenat , 1953: 1066.

FAO Names : En - Western softhead grenadier; **Fr** - Grenadier scie; **Sp** - Abámbolo.

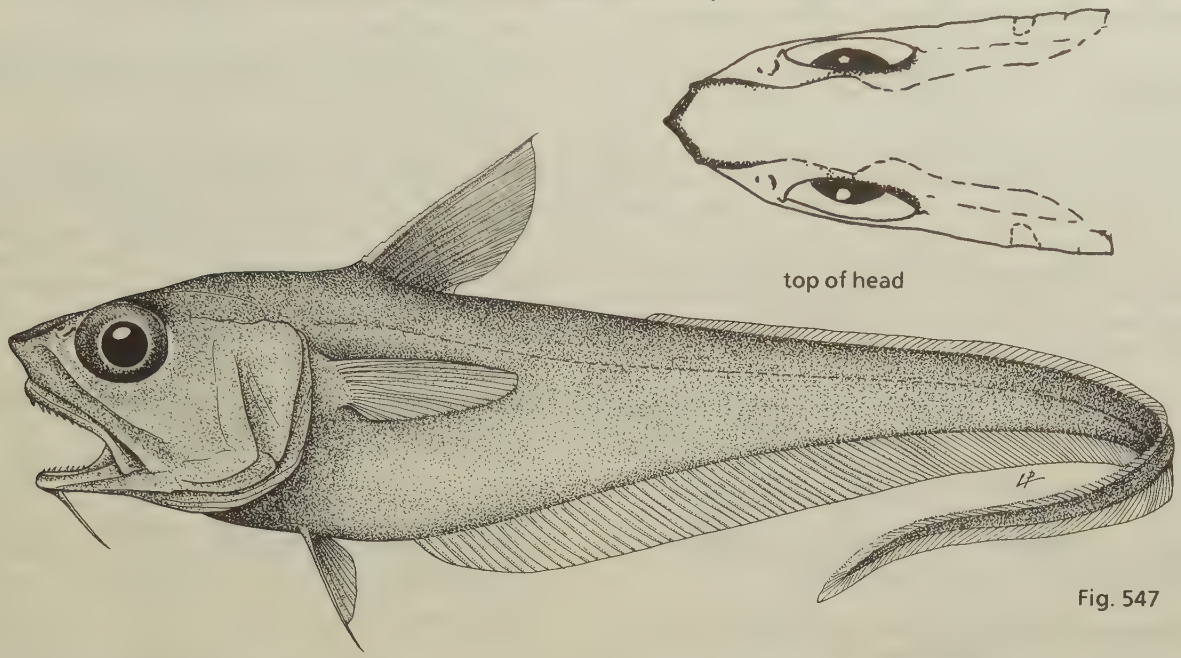


Fig. 547

Diagnostic Features : Snout narrow, weakly pointed, its length 26 to 31% of head length; orbit diameter usually 31 to 35% of head length; interorbital width usually 23 to 27% of head length; distance from orbit to preopercle 41 to 47% of head length; no scales on gular membrane; outer gill rakers on first arch usually 11 to 13 total. Premaxillary teeth in a broad band; one wide-spaced row of canines on mandible. First dorsal fin with 2 spines and 11 to 13 rays, the 2nd spine serrated; pectoral fin rays i20 to i25; pelvic fin rays 8 (7). **Colour:** upper lateral and leading edge of snout, orbital rims, lower margin of suborbital, lips, and gular membrane black.

Geographical Distribution : Tropical and warm-temperate waters of Atlantic (Fig. 548).

Habitat and Biology : Benthopelagic on continental slopes in depths of 200 to 600 m, but most common in about 300 to 500 m.

Size : To about 45 cm total length.

Interest to Fisheries : Taken as bycatch by offshore trawlers throughout its range. Mostly used for fishmeal and oil.

Local Names: CANADA: American straptail grenadier

Literature : Parr (1946); Poll (1953); Iwamoto (1970); Marshall (1973).

Remarks : Marshall (1973) has treated this species as a ***Ventrifossa*** because of its serrated dorsal spine and teeth in bands in premaxillary. The present author's treatment is based on features of the light organ,

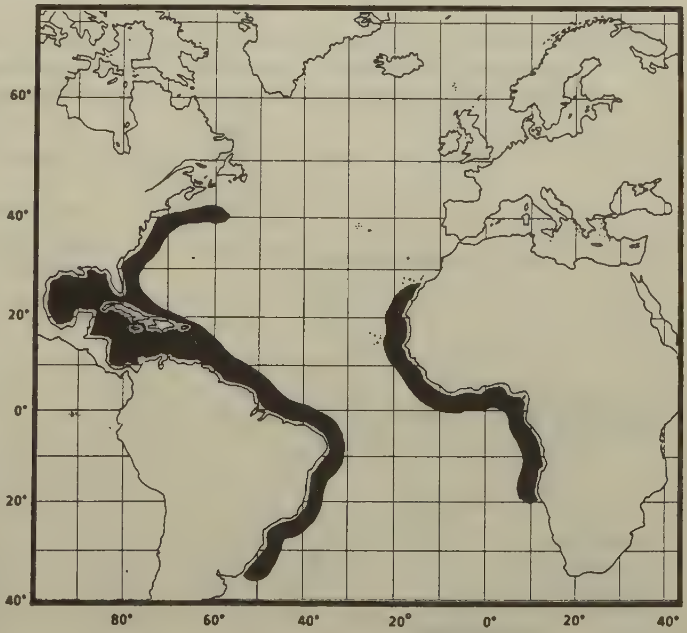


Fig. 548

squamation, mandibular teeth, retia mirabilia and gas glands, and gill rakers, which suggest closer affinity to ***Malacocephalus***. The position of ***M. occidentalis*** appears, indeed, to be somewhat intermediate between the two genera. New species recently described further obscure the distinction between the two and may require a different alignment of the included species.

Mataeocephalus Berg, 1898

MACROUR Mat

Genus with Reference : ***Mataeocephalus*** Berg, 1898, Comm. Mus. Nac. Buenos Aires 1:41 (replacement name for ***Coelocephalus*** Gilbert & Cramer, 1897, preoccupied).

Synonyms : ***Coelocephalus*** Gilbert & Cramer, 1897:422 (non Agassiz, 1843) (type species ***Coelocephalus acipenserinus*** Gilbert & Cramer, 1897, by monotypy).

Diagnostic Features: Snout rather long, flattened, tipped with a bifid terminal snout scute; a rather distinctive row of coarse scales along leading edge of snout; underside of head variously naked; a groove on each side dorsally behind leading edge; mouth small, inferior, upper jaws less than 30% head length. Premaxillary teeth in a wide short band ending far short of end of rictus; mandibular teeth in a broad and short band, or in a moderately long,tapered band. Opercular opening restricted dorsally and ventrally; gill membranes broadly attached to isthmus without a free posterior fold. Outer rakers on first gill arch usually absent, a few rudimentary plates in some individuals. Serrations on first dorsal fin obsolete to few and widely spaced. Spinules on body scales short, conical, in parallel rows. Periproct rather small to large, close to or rather far removed from anal fin.

Habitat, Distribution and Biology: Tropical waters of the Pacific and Indian oceans; not known from the Atlantic. Benthopelagic in about 400 to 1 100 m depth.

Size: To more than 30 cm total length.

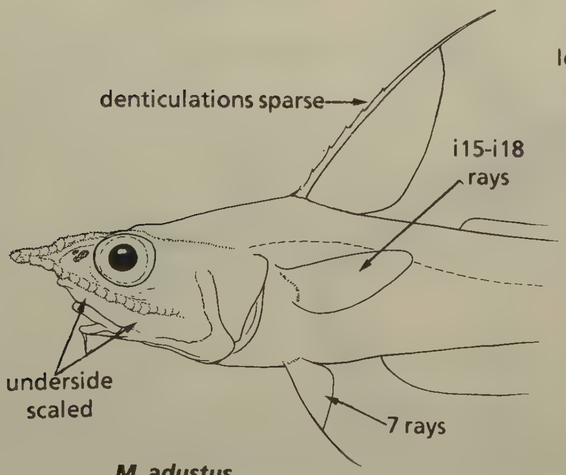
Interest to Fisheries: Most of the species are too small, found too deep, or are too rare to be of commercial significance.

Literature: Marshall (1973); Iwamoto (1979).

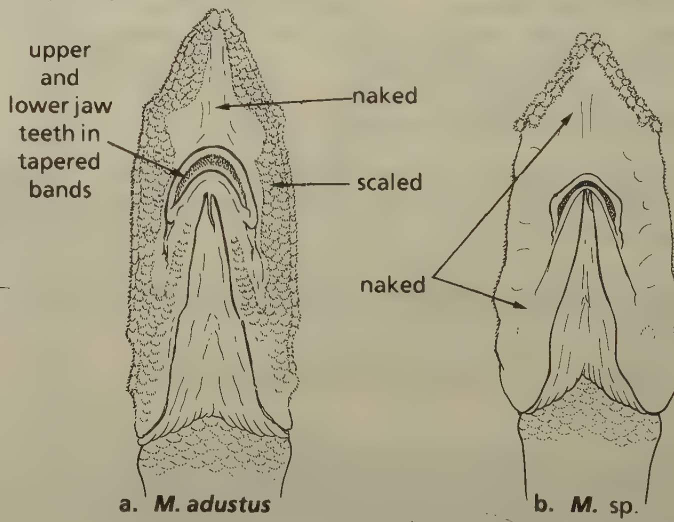
Remarks: Drs. Y. I. Sazonov & Y. N. Shcherbachev (of the P.P. Shirshov Institute of Oceanology) are revising the genus. They have informed the author (in litt., Sept. 1982) that one nominal species is relegated to subspecific level, another is sunk into synonymy, and a third hitherto unrecognized species is included in the genus, giving a total of four species, two of which have two subspecies.

Key to Nominal Species of *Mataeocephalus* (excluding ***M. microstomus*** (Regan, 1908) because of inadequate original description and no study specimens)

1a. Pelvic fin rays 7; pectoral fin rays i15 to i18. Periproct region small. Premaxillary teeth in a broadly tapered band extending almost to end of jaw. Underside of head mostly scaled. Denticulations on second spinous ray of first dorsal fin obsolete or few (3 to 5). (Figs. 549, 550 a) .... ***M. adustus***



M. adustus
(after Radcliffe, 1912) Fig. 549



a. ***M. adustus*** b. ***M.*** sp.

underside of head Fig. 550

1b. Pelvic fin rays 8 or 9; pectoral fin rays i19 to i25. Periproct region moderate to large. Premaxillary teeth in broad, short, truncated bands on anterior part of jaw only (Fig. 551). Underside of head mostly naked (Fig. 550b). Denticulations on second spinous ray of first dorsal fin well developed

2a. Scales below midbase of first dorsal fin 8.5 to 11; below origin of second dorsal fin 6.5 to 9 (Fig. 552) .... ***M. tenuicauda***

2b. Scales below midbase of first dorsal fin 7 or 8; below origin of second dorsal fin 5 to 6

3a. Spinule rows on body scales 8 to 10; distance from orbit to preopercle angle 31 to 35% of head length; suborbital width 16 to 17% of head length; length of upper jaws 22 to 25% of head length; interspace between dorsal fins about 30 to 40% of head length (Fig. 553) .. ***M. nigrescens***

3b. Spinule rows on body scales 5 or 6; distance from orbit to preopercle angle 28 to 30% of head length; suborbital width 13 to 15.5% of head length; length of upper jaws 19 to 21.5% of head length; interspace between dorsal fins 19 to 26% of head length (Fig. 554) ..... ***M. acipenserinus***

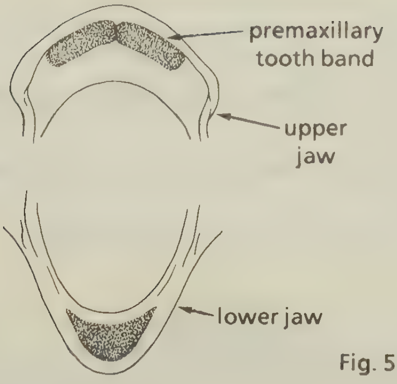
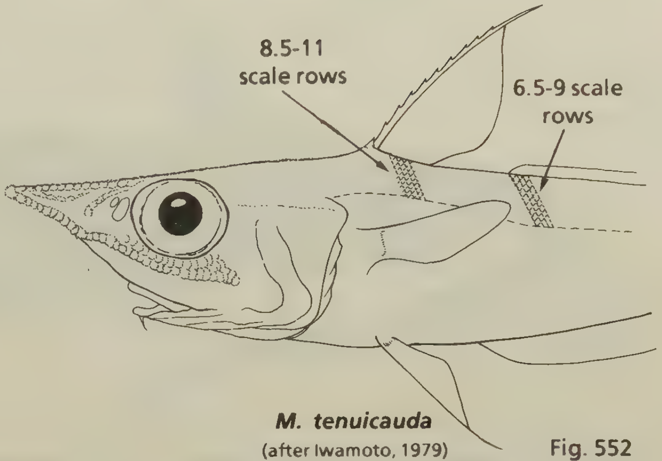
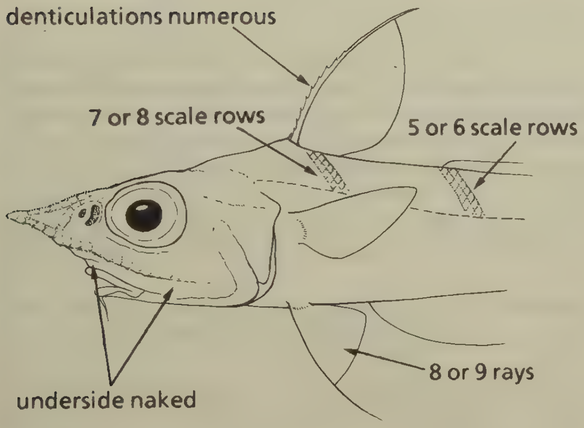

premaxillary tooth band
upper jaw
lower jaw

Fig. 551


8.5-11 scale rows
6.5-9 scale rows

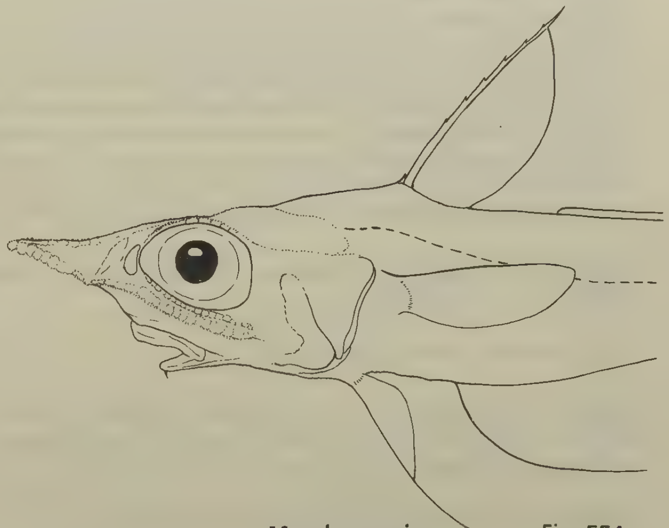
M. tenuicauda
(after Iwamoto, 1979)

Fig. 552


denticulations numerous
7 or 8 scale rows
5 or 6 scale rows
underside naked
8 or 9 rays

M. nigrescens
(after Radcliffe, 1912)

Fig. 553



M. acipenserinus

Fig. 554

List of Species

Mataeocephalus acipenserinus (Gilbert & Cramer, 1897)
Mataeocephalus adustus Smith & Radcliffe, 1912
Mataeocephalus microstomus (Regan, 1908)
Mataeocephalus nigrescens Smith & Radcliffe, 1912
Mataeocephalus tenuicauda (Garman, 1899)

Mataeocephalus acipenserinus (Gilbert & Cramer, 1897) Fig. 555 **MACROUR Mat 1**

Scientific Name with Reference : ***Coelocephalus acipenserinus*** Gilbert & Cramer, 1897: Proc. U.S. Natl. Mus. 19: 422, pl. 42, fig. 1 (Kaiwi Channel, Hawaiian Islands, 337 fms (616 m)).

Synonyms : ***Mataeocephalus acipenserinus*** -- Gilbert, 1905.

FAO Names : En - Sturgeon grenadier.

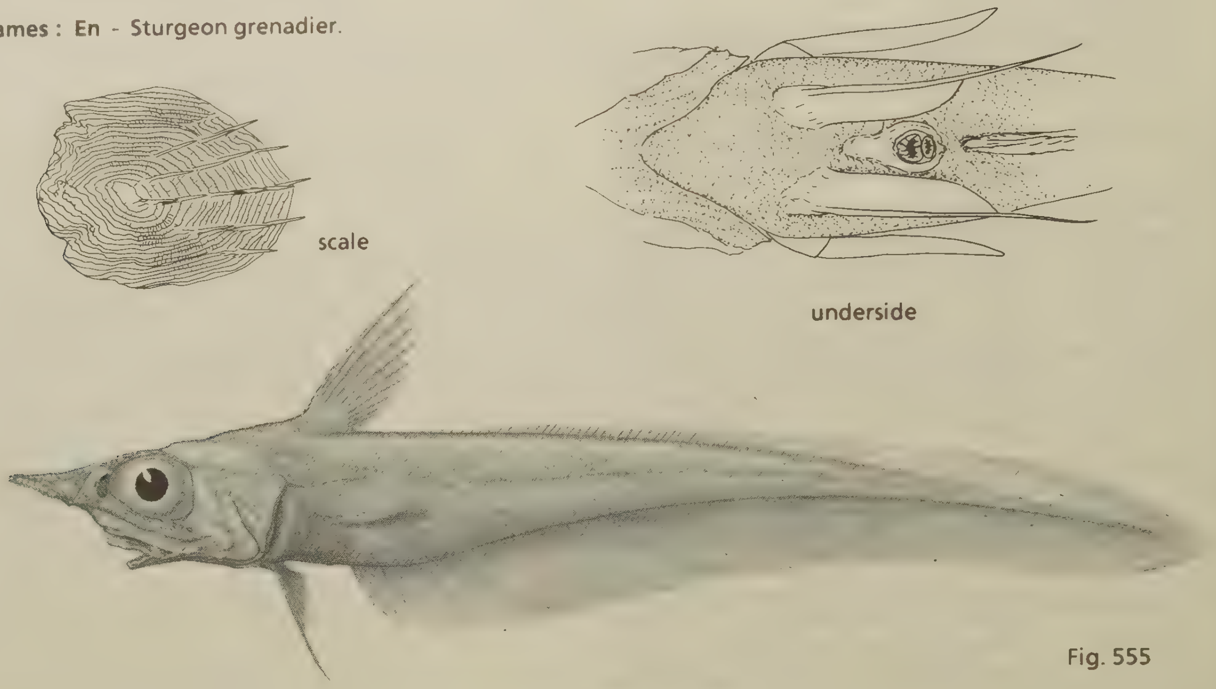


Fig. 555

Diagnostic Features : Snout with a prominent, bifid, terminal scute, its length 38 to 42% of head length; underside of head almost entirely naked, with relatively little ventral overlap of scales along leading snout edge; posterior nostril less than 4 times into orbit diameter; orbit diameter 27 to 30% of head length; interorbital width 19 to 22% of head length; barbel 3 or 4% of head length; inner gill rakers on first arch usually 7 or 8 total. Jaw teeth in wide, short bands, occupying anterior part of mouth only. First dorsal fin with 2 spines and 8 or 9 segmented rays, serrations on second spine few and widely spaced, height of fin 55 to 64% of head length; pectoral fin rays i20 to i24; pelvic fin rays 8 or 9. Spinules on body scales short, conical, reclined, in 4 to 6 parallel rows, none particularly enlarged; scales below second dorsal fin about 8. Periproct moderate sized, pear-shaped to oval, situated about midway between pelvic and anal fins; a small black fossa anterior to anus usually developed.

Geographical Distribution : Hawaiian Islands (Fig. 556)

Habitat and Biology: Benthopelagic in about 400 to 730 m depth.

Size : To about 20 cm total length.

Interest to Fisheries : A very abundant species in about 400 to 700 m depth off Hawaii, but of no current commercial interest.

Literature : Gilbert & Cramer (1897); Gilbert (1905).

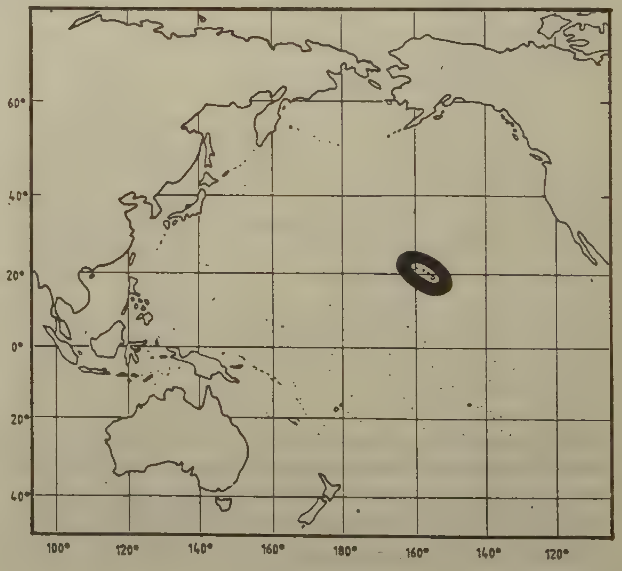


Fig. 556

Mataeocephalus tenuicauda (Garman, 1899)

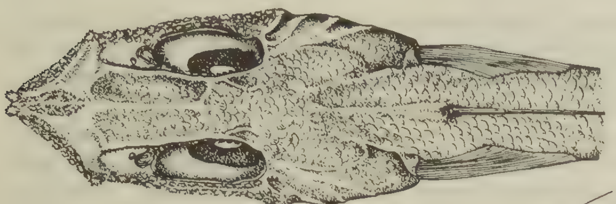
Fig. 557

MACROUR Mat 2

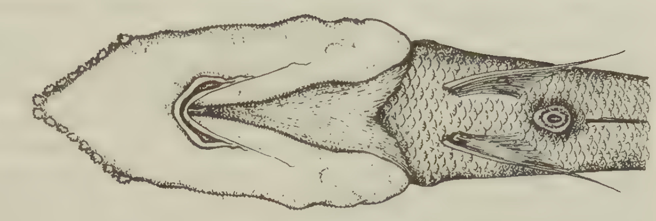
Scientific Name with Reference : ***Macrurus tenuicauda*** Garman, 1899, Mem. Mus. Comp. Zool. Harvard 24: 216, pl. 49, fig. 1 (Gulf of Panama, ALBATROSS sta. 3384, 838 m).

Synonyms : ***Mataeocephalus tenuicauda*** -- Gilbert & Hubbs, 1916.

FAO Names : En - Slendertail grenadier.



top of head



underside

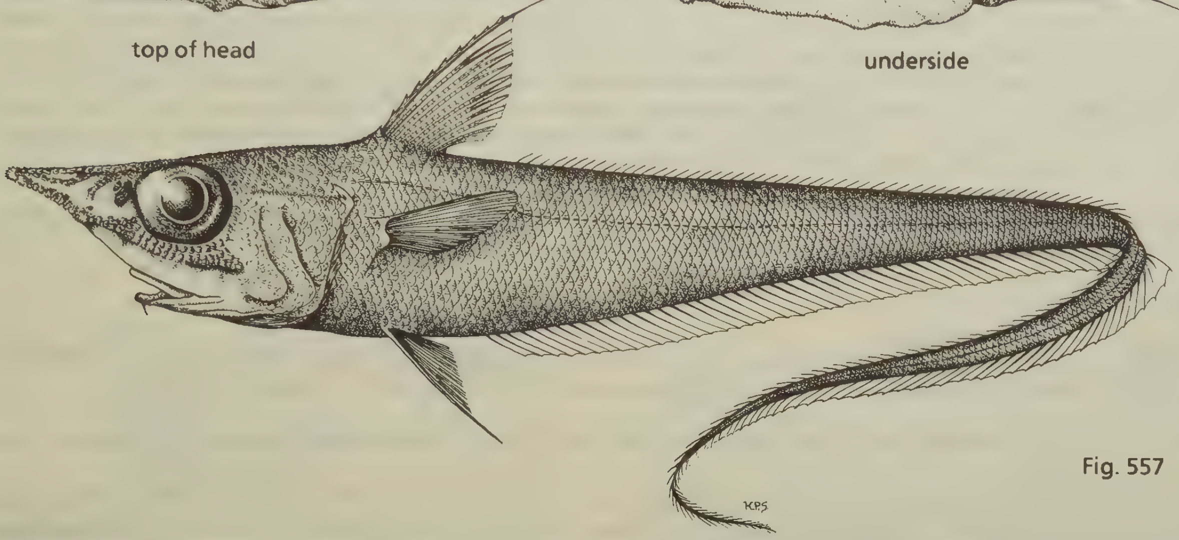


Fig. 557

Diagnostic Features : Snout with a prominent, bifid terminal scute; snout length 36 to 42% of head length; posterior nostril less than 5 times into orbit diameter; underside of head almost entirely naked, with relatively little ventral overlap of scales along leading snout edge; orbit 26 to 30% of head length; interorbital 19 to 22% of head length; barbel 4 to 6% of head length; inner gill rakers of first arch usually 6 to 8 total. Premaxillary teeth in wide, short, truncated band ending far short of end of rictus; mandibular teeth in a broad, short, tapered band. First dorsal fin with 2 spines and 8 to 10 segmented rays, its length 52 to 63% of head length; pectoral fin rays i21 to i25; pelvic fin rays 8 or 9. Spinules on body scales short, conical, in parallel rows, none particularly enlarged; scales below second dorsal fin 8.5 to 11. Periproct large, oval, removed from anal fin by several scale rows; pyloric caeca 16 to 21.

Geographical Distribution : Pacific coast of Panama and Ecuador; Cocos Island; Galapagos (Fig. 558).

Habitat and Biology : Benthopelagic in 700 to 1 159 m depth.

Size : To more than 30 cm total length.

Interest to Fisheries : A common species in about 700 to 1100 m depth off the Pacific coast of Panama and Ecuador, but of no current commercial interest.

Literature : Garman (1899); Iwamoto (1979).

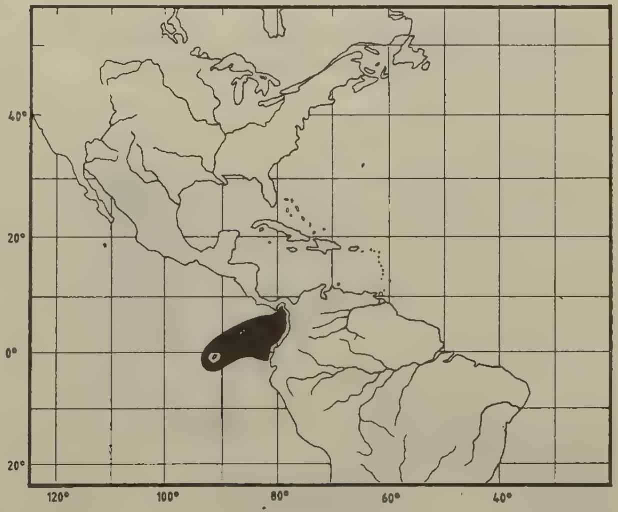


Fig. 558

Nezumia Jordan, 1904

Genus with Reference : ***Nezumia*** Jordan, in Jordan & Starks, 1904, Bull. U.S. Fish Comm. (1902), 22: 620 (type species ***Nezumia condylura*** Jordan & Gilbert, 1904, by original designation).

Synonyms : [?]***Macruroplus*** Bleeker, 1874 (type species ***Macrurus serratus*** Lowe, 1843, by original designation; considered a nomen nudum because the holotype is lost and the original description is inadequate to determine what species it represents).

Diagnostic Features : Macrourines with 7 branchiostegal rays. Snout pointed to bluntly rounded with spiny tuberclelike scales at tip and lateral angles in all but a few species; suborbital shelf covered with 2 or more rows of stout, spiny, deeply embedded scales in all but a few species; snout and suborbital space with naked areas ventrally in most species; mouth subterminal, upper jaws usually less than 40% of head length; a small barbel present. Teeth small, in narrow to broad bands that fall short of end of rictus; premaxillary teeth do not extend beyond maxillary process, outer series usually slightly enlarged. Rakers present on outer side of first gill arch; inner rakers usually less than 12. Second spinous ray of first dorsal fin usually slightly prolonged and serrated along leading edge (serrations often obsolete in ***N. liolepis***); pelvic fin rays 6 to 17. Anus removed from anal fin origin (usually closer to pelvic fin insertion) and situated within an oval area of naked black skin (the periproct); a small round to teardrop-shaped fossa forming anterior point of periproct in most species, detached from periproct in some, obsolete in a few. Body scales with reticulate structure, exposed surfaces covered with needlelike to broadly shield-shaped spinules. Pyloric caeca 30 or less in most species, but as many as 60 in a few. Retia mirabilia 2, slender and uncoiled; gas glands globular to somewhat flattened. Precaudal vertebrae usually 13 to 14.

Habitat Distribution and Biology : Worldwide in tropical to temperate seas, from about 200 m to more than 2000 m depth. Benthopelagic in about 200 m to more than 2000 m.

Size: To 45 cm.

Interest to Fisheries : The relatively small size of most members of the genus makes this group of limited commercial potential, although a few are used in fishmeal and other processed fish products.

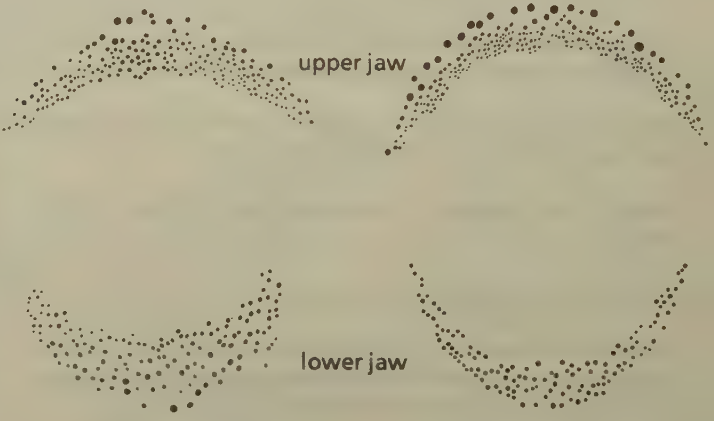
Literature: Gilbert & Hubbs (1916; 1920); Parr (1946); Iwamoto (1970; 1979); Marshall & Iwamoto (in Marshall, 1973).

Remarks : The genus is closely related to, and shares many feature with, ***Ventrifossa*** and ***Lucigadus***. These genera are not well defined and a number of species have been switched from one genus to the other. Several species groups seem to be present, but the distinction between one or another usually becomes obscured by the presence of species having intermediate characters. ***Lucigadus*** has been separated by Sazonov (1985) from ***Ventrifossa***, but is retained for now as a subgenus. ***Kuronezumia*** probably warrants taxonomic separation from ***Nezumia*** but is also treated as a subgenus. ***Nezumia*** as currently defined is probably polyphyletic.

Key to *Nezumia* Groups

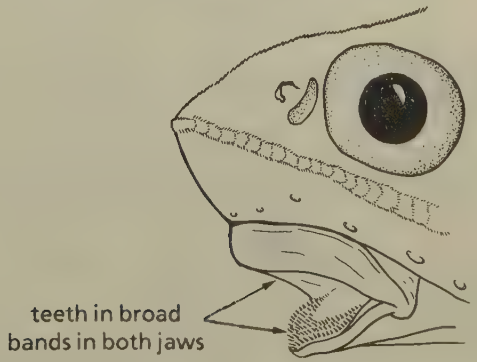
1a. Teeth in both upper and lower jaws in broad cardiform bands (Fig. 559, 560a) ...... **Group A**

1b. Teeth in jaws in moderately broad to narrow bands (Fig. 560b) or in two or three rows



a. ***N. holocentra*** b. ***Nezumia*** sp.

tooth pattern in jaws Fig. 560



head Fig. 559

2a. Snout blunt, naked over almost all of dorsal and ventral surfaces (Fig. 561) .... **Group B**

2b Snout blunt or pointed, usually mostly scaled dorsally, naked or fully scaled ventrally

  3a. Snout blunt, fully scaled (except sometimes a narrow naked strip along ventral margin) (Fig. 562) .... **Group C**

  3b. Snout blunt or pointed, almost all with a moderate to broad naked area ventrally (Fig. 563, 564)

    4a. Pelvic fin rays 7 .... **Group D**

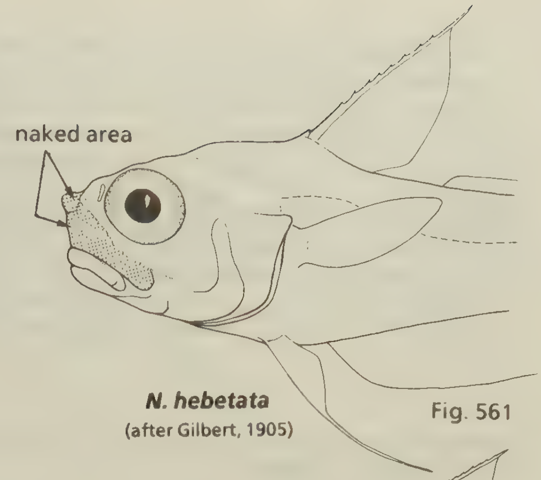
    4b. Pelvic fins rays 8 or more

      5a. Pelvic fin rays 8 to 10 .... **Group E**

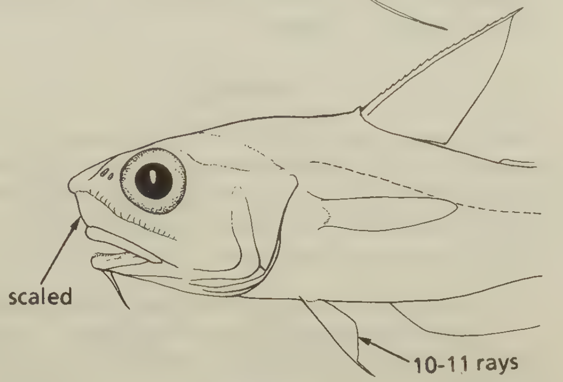
      5b. Pelvic fin rays 11 or more

        6a. Pelvic fin rays 11 or 12 ..... **Group F**

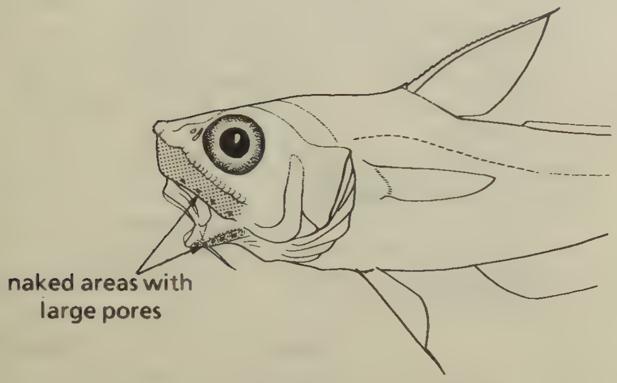
        6b. Pevic fin rays 13 or more .. **Group G**



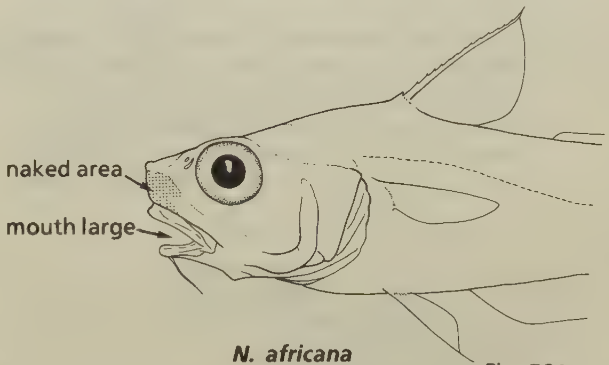
N. hebetata
(after Gilbert, 1905)
Fig. 561



N. pudens
(after Iwamoto, 1979)
Fig. 562



N. longebarbata
(after Marshall & Iwamoto, in Marshall, 1973)
Fig. 563



N. africana
(after Iwamoto, 1970)
Fig. 564

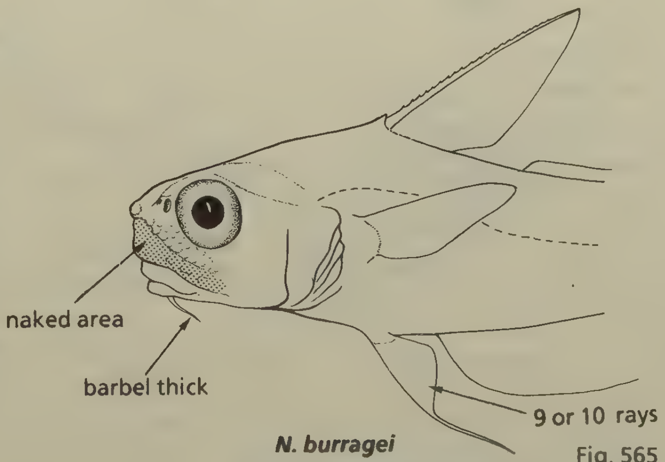
Key to Species of *Nezumia* by Groups

Teeth in both upper and lower jaws in broad cardiform bands - Group A

Group A

1a. Snout high and blunt, scarcely protruding beyond mouth; underside of head back to level of angle of mouth entirely naked; chin barbel thick, about 20% of head length; pelvic fin rays 9 or 10 .... ***N. burragei*** (Hawaii) (Fig. 565)

1b. Snout pointed, protruding well beyond mouth; underside of head scaled or naked; barbel slender, 7 to 19% of head length; pelvic fin rays 8 or 9



N. burragei
(after Gilbert, 1905)
Fig. 565

2a. Underside of head back to level of mouth angle and mandibles naked; scale rows below origin of second dorsal fin about 8.5; barbel 7 to 9 % of head length .... ***N. holocentra***
(Hawaii) (Fig. 566)

2b. Underside of head almost entirely scaled; scale rows below origin of second dorsal fin about 12; barbel about 19% of head length .... ***N. leonis***
(Southern Africa) (Fig. 567)

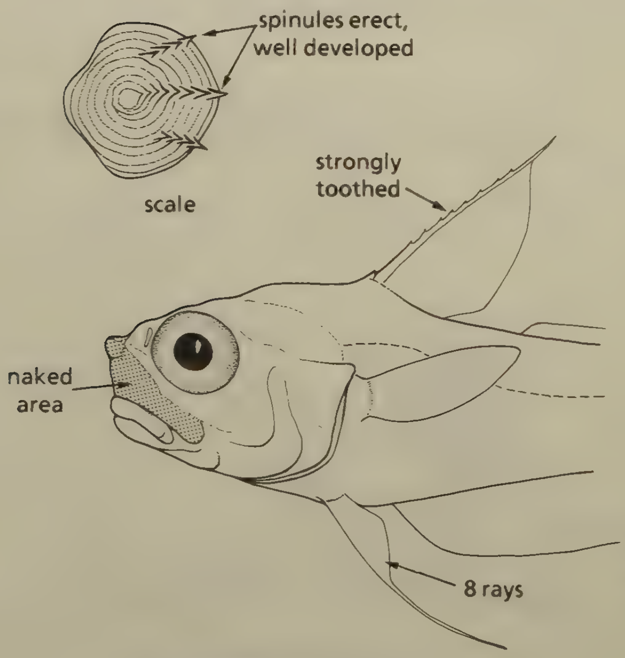
Snout blunt, naked over almost all of dorsal and ventral surfaces - Group B

Group B

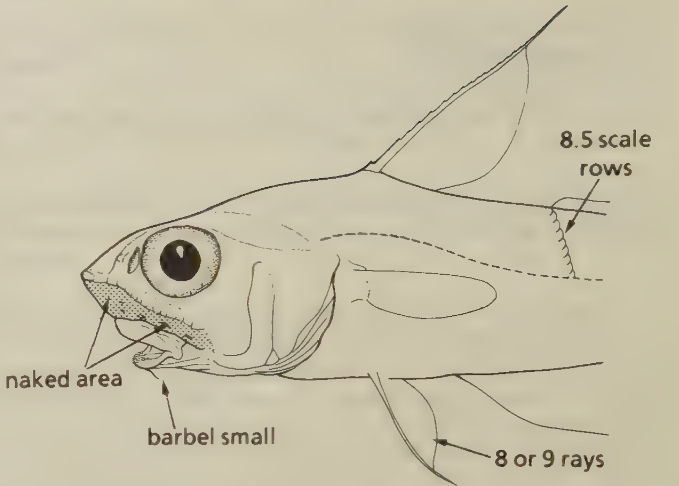
This group is very similar to ***Parakumba*** in the members having extensive areas of the snout and underside of head naked. Unlike ***P. maculisquamis***, the sole member of that genus, members of Group B lack an expanded, broad head.

1a. Pelvic fin rays 8; spinous dorsal ray strongly denticulate along leading edge; scales relatively adherent, with erect spinules in distinct rows .... ***N. hebetata***
(Hawaii) (Fig. 568)

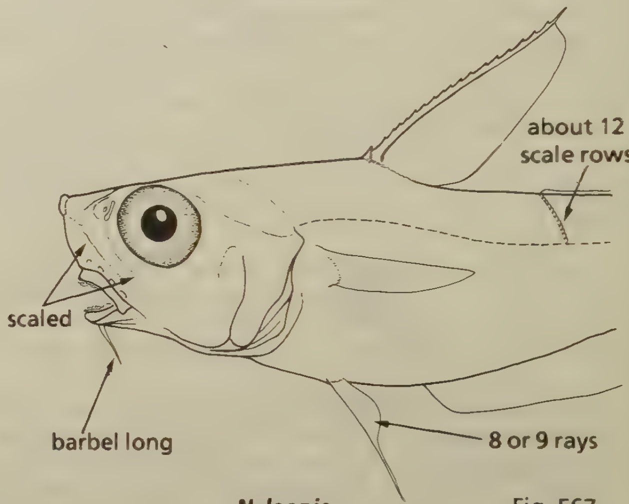
1b. Pelvic fin rays 10 or 11 (rarely 12); spinous dorsal ray smooth or with a few weak teeth along leading edge; scales highly deciduous and thin, spinules weak, greatly reclined or absent .... ***N. liolepis***
(E. Pacific) (Fig. 569)


spinules erect, well developed
scale
strongly toothed
naked area
8 rays

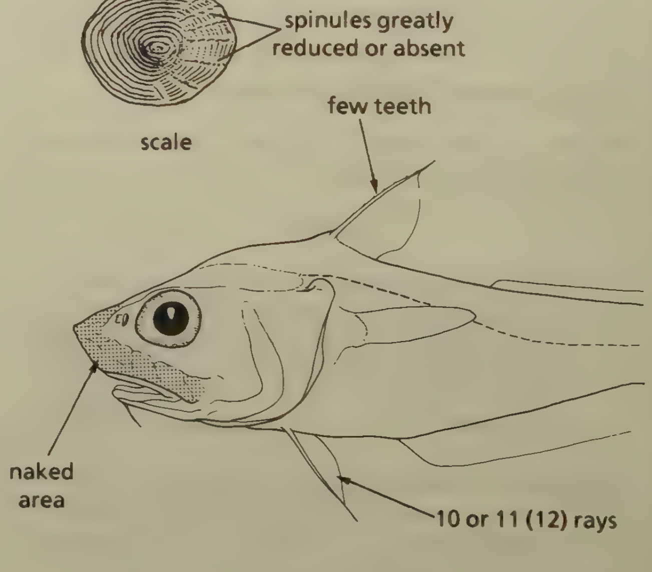
N. hebetata Fig. 568
(after Gilbert, 1905)


8.5 scale rows
naked area
barbel small
8 or 9 rays

N. holocentra Fig. 566


about 12 scale rows
scaled
barbel long
8 or 9 rays

N. leonis Fig. 567
(after Iwamoto in Smith & Heemstra, 1986)


spinules greatly reduced or absent
scale
few teeth
naked area
10 or 11 (12) rays

N. liolepis Fig. 569
(after Iwamoto, 1979)

Snout blunt, fully scaled (except sometimes a narrow naked strip along ventral margin) - Group C

Group C

1a. Origin of first dorsal and pectoral fins about on same vertical; upper jaw extends posteriorly to below anterior edge of pupil; scale rows below origin of second dorsal 11 to 14

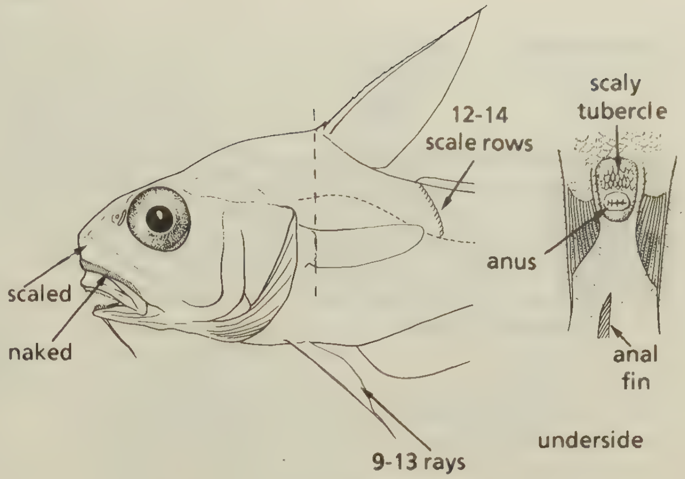
2a. A large scaly tubercle between pelvic fin bases; scale rows below origin of second dorsal 12 to 14 .... ***N. bubonis***
(Hawaii, W. Atlantic) (Fig. 570)

2b. No scaly tubercle between pelvic fins; scale rows below second dorsal 11 or 12 .... ***N. dara***
(Japan) (Fig. 571)

1b. Origin of first dorsal behind that of pectoral; upper jaw extends to below midorbit or beyond; scale rows below second dorsal 8.5 to 11

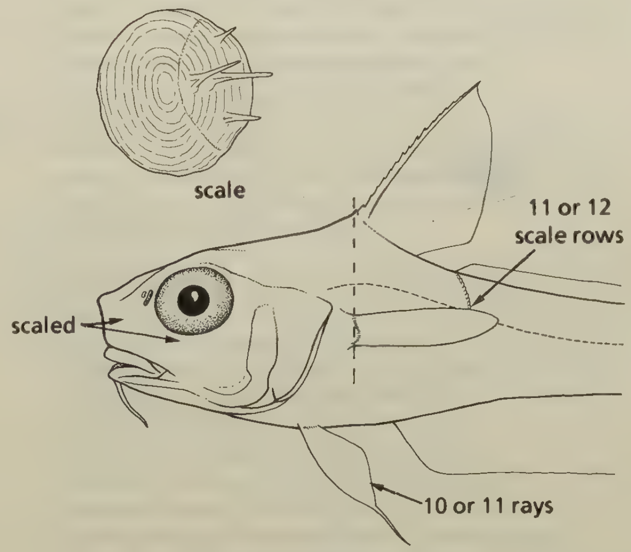
3a. Scale rows below second dorsal 8.5 to 10.5; outer pelvic ray rather short, 44 to 58% of head length; orbits 31 to 35%; interspace between dorsal fins 34 to 43% of head length .... ***N. pudens***
(Chile) (Fig. 572)

3b. Scale rows below second dorsal 10 or 11; outer pelvic ray long, 75 to 95% of head length; orbit 27 to 30% of head length; interspace between dorsal fins 22 to 32% of head length .... ***N. macronema***
(W.C. Pacific) (Fig. 573)


12-14
scale rows
scaly
tubercle
anus
scaled
naked
anal
fin
underside
9-13 rays

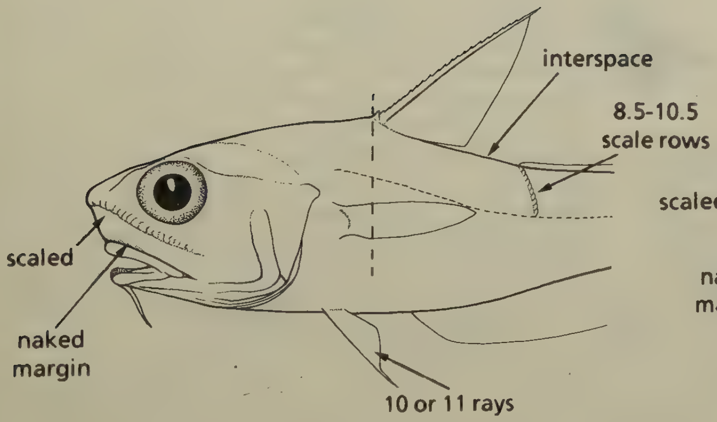
N. bubonis
(after Iwamoto, 1974)

Fig. 570


scale
11 or 12
scale rows
scaled
10 or 11 rays

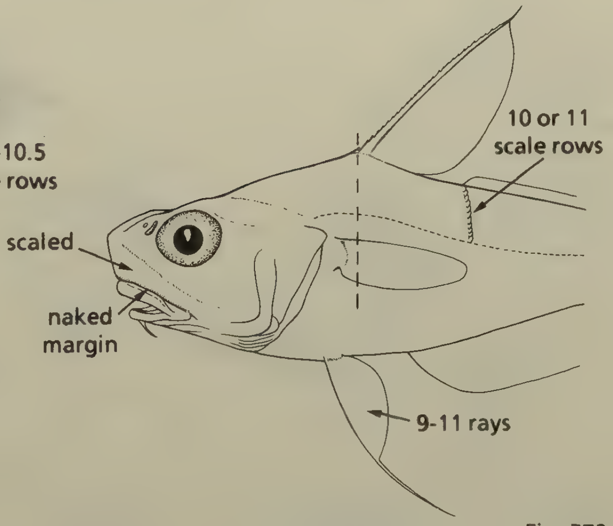
N. dara
(after Gilbert & Hubbs, 1916)

Fig. 571


interspace
8.5-10.5
scale rows
scaled
naked
margin
10 or 11 rays

N. pudens
(after Iwamoto, 1979)

Fig. 572


10 or 11
scale rows
scaled
naked
margin
9-11 rays

N. macronema

Fig. 573

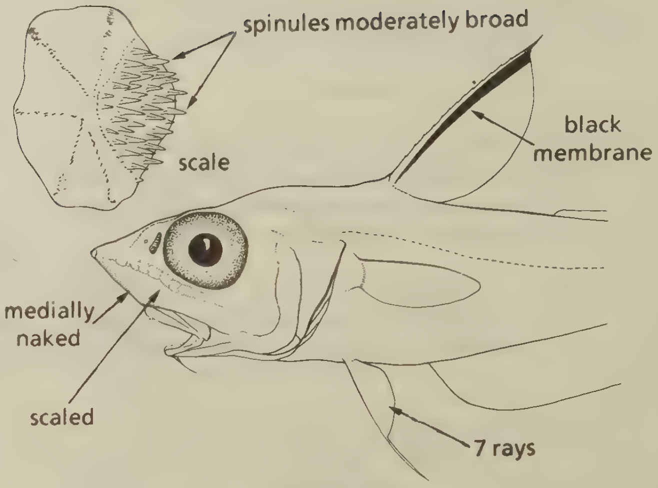
Group D

1a. Membrane between spinous second ray and first segmented ray of first dorsal fin black, the fin otherwise pale; underside of head (including mandible) uniformly scaled except for a narrow to moderately broad median strip on snout; spinules on body scales lanceolate to moderately broad .... ***N. bairdii***
(W.N. Atlantic) (Fig. 574)

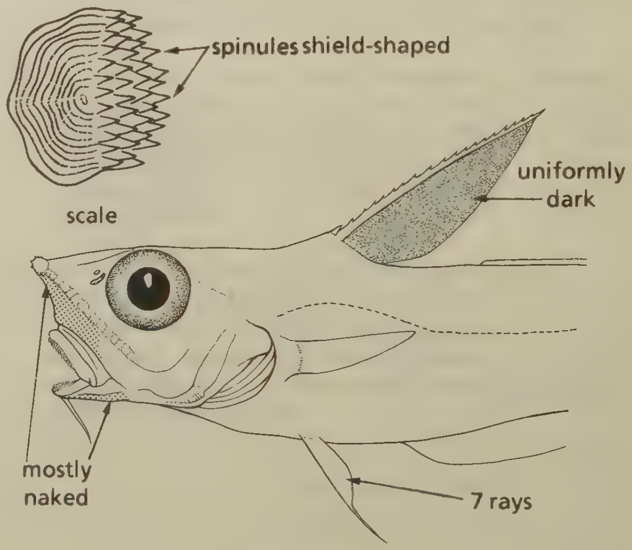
1b. First dorsal blackish overall or distally only; underside of head mostly naked on snout and, in some, posteriorly to above mouth angle; mandible naked over anterior third to three-quarters; spinules on body scales broad, mostly shield-shaped

2a. First dorsal fin blackish overall; colour medium to dark brown overall, bluish over abdomen, blackish over throat, opercles, and pelvic region; most of underside of snout and suborbital region to mouth angle naked or sparsely covered with small, loose scales; mandibles mostly naked .... ***N. suilla***
(W.N. Atlantic) (Fig. 575)

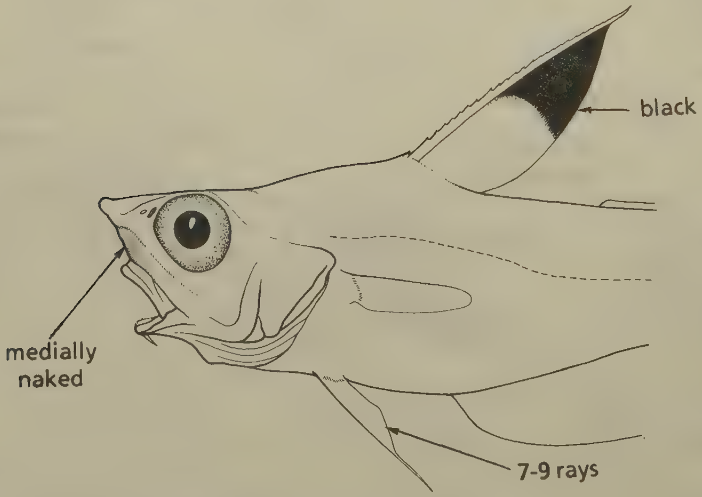
2b. First dorsal fin black-tipped; colour overall light brown or somewhat tawny to dirty greyish brown, the abdomen (and in some the entire trunk) bluish to violet, blackish with a bluish tint over throat, opercles, and pelvic region, silvery in fresh specimens over opercles and much of ventral parts of head and trunk; underside of snout variously naked, from a moderately wide median strip to naked over most of underside of snout; mandibles scaled at least on posterior half .... ***N. aequalis***
(Atlantic) (Fig. 576)


spinules moderately broad
scale
black membrane
medially naked
scaled
7 rays

N. bairdii Fig. 574


spinules shield-shaped
scale
uniformly dark
mostly naked
7 rays

N. suilla
(after Marshall & Iwamoto in Marshall, 1973) Fig. 575


black
medially naked
7-9 rays

N. aequalis Fig. 576

Pelvic fin rays 8 to 10 - Group E

Group E

1a. Body scales with conical, needlelike to narrowly lanceolate spinules

2a. Scales very small, covered with long, erect, needlelike spinules; 11 to 14 scale rows below origin of second dorsal fin, about 50 lateral-line scales over a distance equal to predorsal length; most of underside of snout and suborbital scaled; pelvic fin rays 10 to 12; bathypelagic .... ***N. parini*** (E.C. Pacific) (Fig. 577)

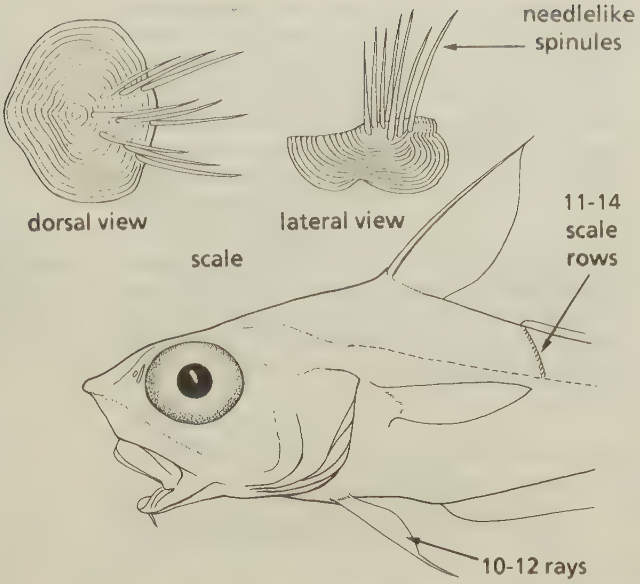
2b. Scales small to moderate-sized, covered with short to long, greatly recumbent to moderately erect, short conical to moderately long needlelike spinules; 6 to about 10 scale rows below origin of second dorsal, less than 45 lateral-line scales over a distance equal to predorsal length; underside of snout and suborbital mostly naked or almost entirely scaled; pelvic fin rays 8 to 11; benthopelagic

3a. First dorsal fin with a distinct blackish tip or membrane separating spinous ray and first segmented ray blackish

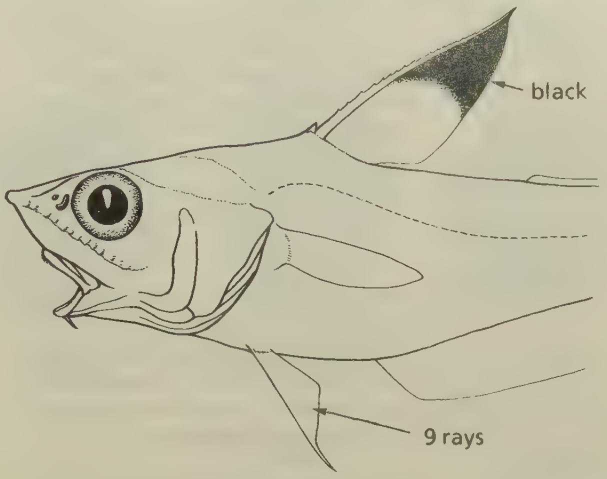
4a. First dorsal fin with a distinct blackish tip; head less than 5 times into total length; barbel more than twice into orbit diameter; spinules on body scales conical to narrowly lanceolate .... ***N. orbitalis*** (E.C. Pacific) (Fig. 578)

4b. First dorsal fin with membrane separating spinous ray and first segmented ray blackish; head more than 6 times into total length; barbel less than twice into orbit diameter; spinules on body scales conical, needlelike .... ***N. toi*** (New Zealand)(Fig. 579)

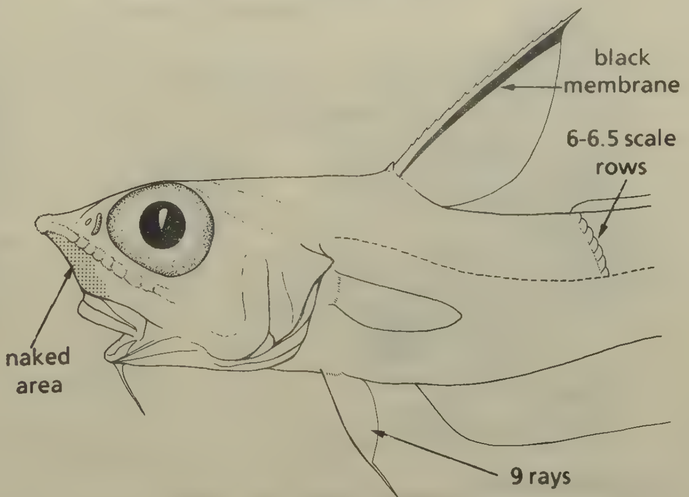
3b. First dorsal fin uniformly blackish or blackish at base



N. parini Fig. 577
(after Hubbs & Iwamoto, 1977)



N. orbitalis Fig. 578
(after Iwamoto, 1979)



N. toi Fig. 579
(after McCann & McKnight, 1980)

5a. Underside of head almost entirely covered with fine, small scales; body scales with short, greatly recumbent overlapping spinules (the tips barely raised) arranged in discrete longitudinal rows (as many as 11 in largest specimens); pelvic fins with 8 or 9 rays .... ***N. investigatoris***
(Bay of Bengal) (Fig. 580)

5b. Underside of snout naked, scaleless region extending back to angle of mouth and onto mandibles in some; body scales with short to long, moderately recumbent spinules in few to many longitudinal rows; pelvic fins with 8 to 11 rays

6a. Gill rakers on lower limb of first arch 5 to 7; pelvic fin rays usually 10 or 11, occasionally 9 .... ***N. convergens***
(E. Pacific) (Fig. 581)

6b. Gill rakers on lower limb of first arch 8 or more; pelvic fin rays usually 8 or 9, occasionally 10

7a. Spinous dorsal ray long, about equal to distance from snout to anus; spinules on body scales needlelike, in slightly convergent rows, none of which are particularly enlarged .... ***N. spinosa***
(Southern Japan to S. China Sea) (Fig. 582)

7b. Spinous dorsal ray moderate, about equal to head length or less; spinules on body scales short, conic to needlelike, in parallel to convergent rows, the median rows enlarged in some

8a. Snout notably blunt; preopercle margin broadly rounded .... ***N. ectenes***
(Hawaii) (Fig. 583)

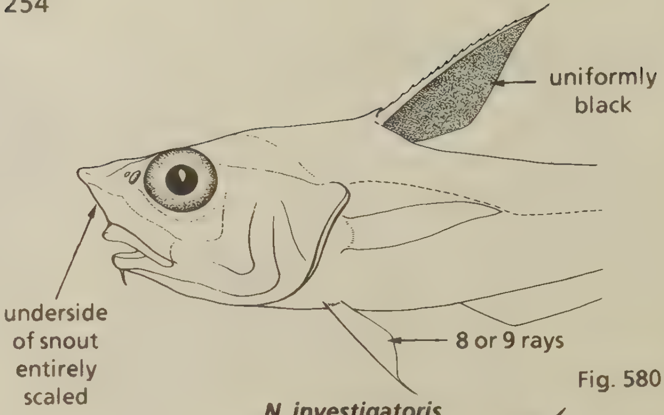
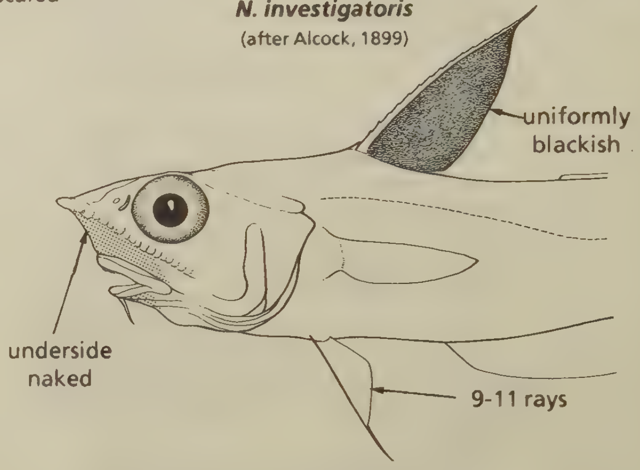

uniformly black
underside of snout entirely scaled
8 or 9 rays

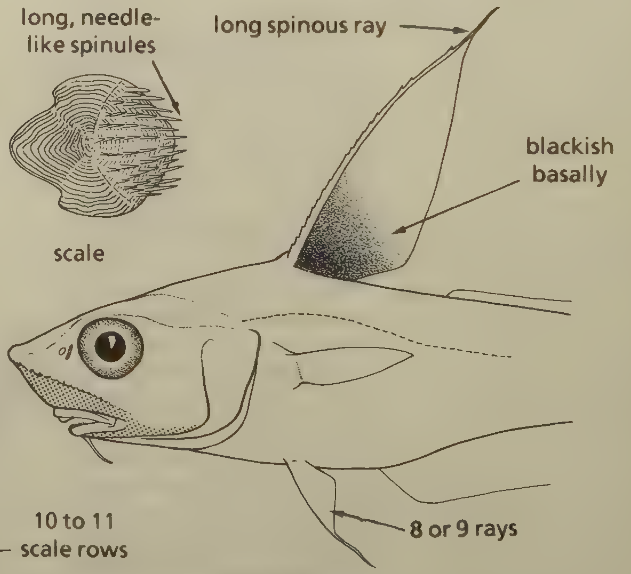
Fig. 580

N. investigatoris
(after Alcock, 1899)


uniformly blackish
underside naked
9-11 rays

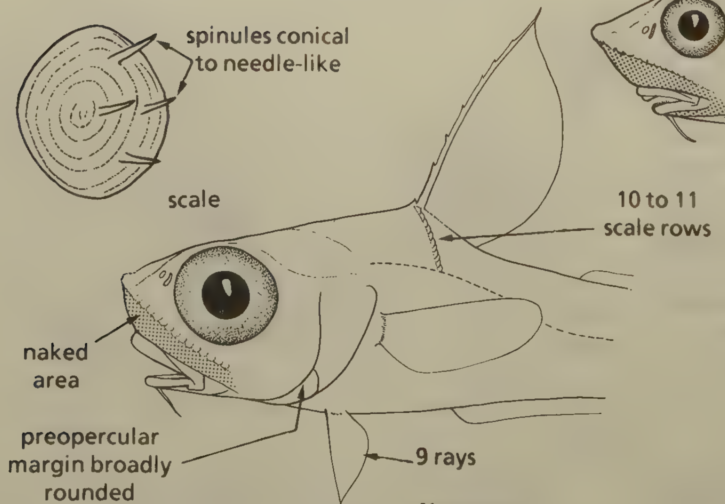
N. convergens
(from Iwamoto, 1979)

Fig. 581


long, needle-like spinules
long spinous ray
blackish basally
scale
8 or 9 rays

N. spinosa
(after Gilbert & Hubbs, 1916)

Fig. 582


spinules conical to needle-like
scale
10 to 11 scale rows
naked area
preopercular margin broadly rounded
9 rays

N. ectenes
(after Gilbert & Cramer, 1897)

Fig. 583

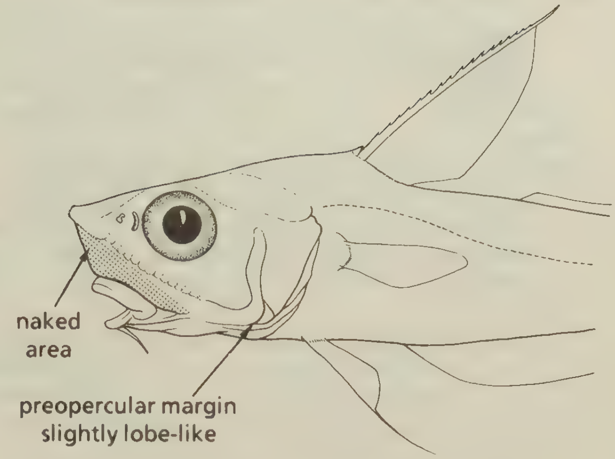
8b. Snout more pointed; preopercle margin slightly lobe-like ...... ***N. sclerorhynchus*** (N. Atlantic) (Fig. 584)

1b. Body scales with lanceolate, triangular, or shield-shaped spinules (Fig. 585)

9a. Entire trunk, and tail from anal fin origin posteriorly over a distance about equal to head length, encircled with a broad blackish band; gill rakers on second arch 13 to 17 total; gill membranes of opposite sides narrowly connected across isthmus, the gill openings extending forward to level of posterior end of mandibles (Fig. 586 a); barbel small, 7 to 10% of head length .... ***N. micronychodon*** (E.C. Atlantic) (Fig. 587)

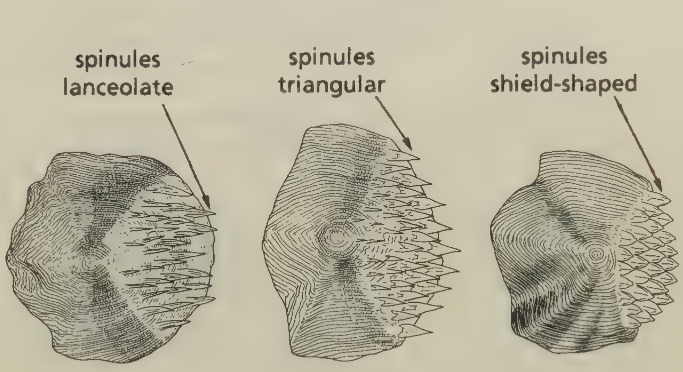
9b. Trunk blackish on ventral abdominal area only (dorsally paler, no banded pattern); gill rakers on second arch 13 or fewer; gill openings more restricted, falling short of level of posterior end of mandibles (Fig. 586 b); barbel small to moderate, 7 to more than 30% of head length

10a. Snout blunt, protruding little beyond the relatively large, almost terminal mouth; suborbital region flat, almost vertical, the mouth essentially lateral; barbel long, usually more than 20% of head length, or two-thirds of orbit diameter


naked area
preopercular margin slightly lobe-like

N. sclerorhynchus Fig. 584

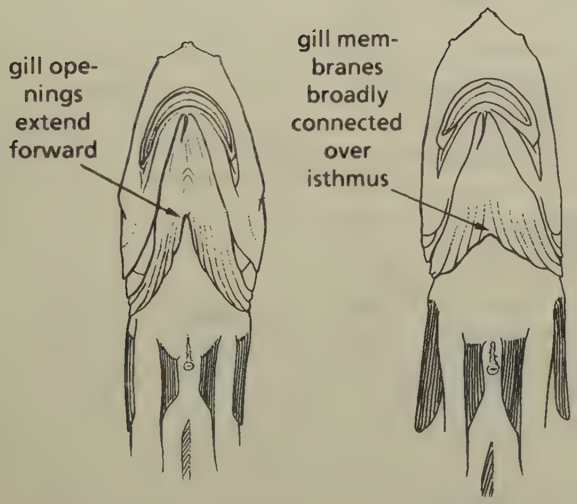
(after Marshall & Iwamoto in Marshall, 1973)


spinules lanceolate
spinules triangular
spinules shield-shaped

a. ***N. orbitalis*** b. ***N. milleri*** c. ***N. aequalis***

(after Parr, 1946)

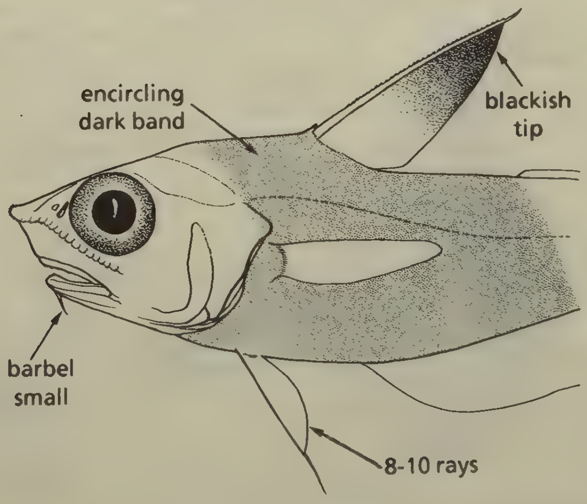
scales Fig. 585


gill openings extend forward
gill membranes broadly connected over isthmus

a. ***N. micronychodon*** b. ***N. duodecim***

underside Fig. 586

(after Iwamoto, 1970)


encircling dark band
blackish tip
barbel small
8-10 rays

N. micronychodon Fig. 587

(after Iwamoto in Smith & Heemstra, 1986)

11a. Pelvic fins with 8 rays; pectorals with 25 rays; inner gill rakers on first arch 9 total; scales with relatively long and broad triangular spinules (Fig. 588a) .... ***N. africana***
(E.C. Atlantic) (Fig. 589)

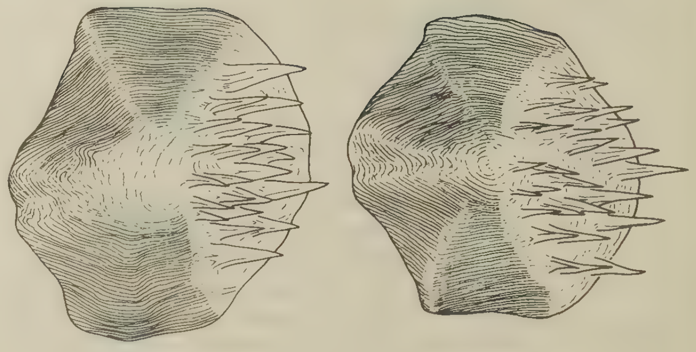
11b. Pelvic fins with 9 or 10 rays; pectorals with 20 to 24 rays; inner gill rakers on first arch 9 to 12 total; spinules on body scales short, broadly triangular, or long and relatively slender (Fig. 588b)

12a. First dorsal fin with 2 spines and 11 to 13 rays; mouth large, upper jaw 40 to 45% of head length .... ***N. atlantica***
(W.C. Atlantic) (Fig. 590)

12b. First dorsal fin with 2 spines and 8 to 10 rays; mouth moderate, upper jaw 31 to 37% of head length

13a. Height of first dorsal fin 2/3 or less of head length; scale spinules long and narrowly lanceolate .. ***N. stelgidolepis***
(E.Pacific) (Fig. 591)

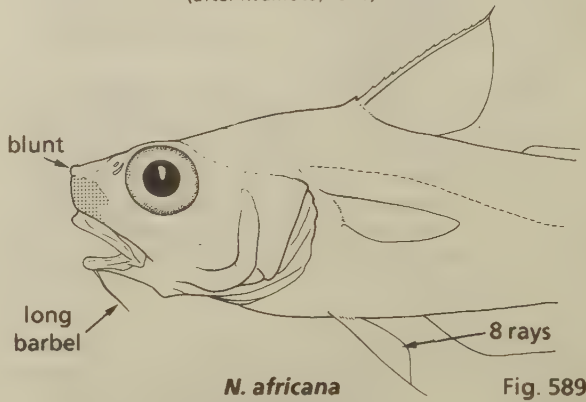
13b. Height of first dorsal fin about equal to head length; scale spinules short and triangular .... ***N. tomiyamai***
(Japan) (Fig. 592)



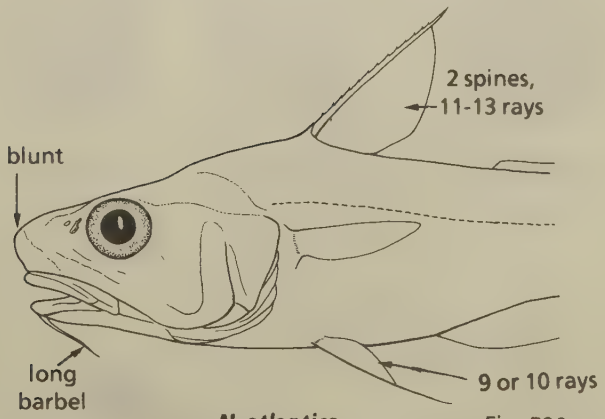
a. *N. africana* **b. *N. atlantica***

scales
(after Iwamoto, 1970)

Fig. 588

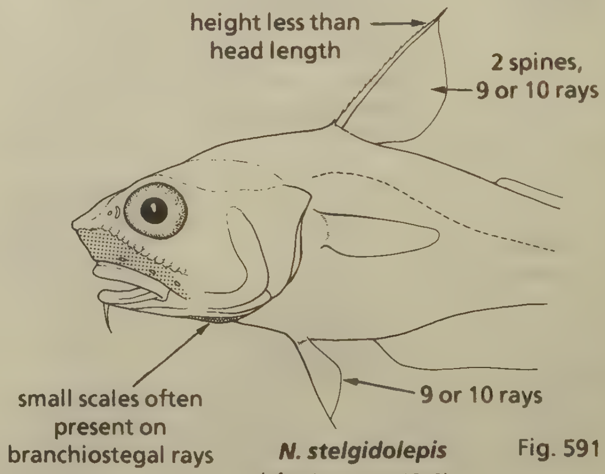

blunt
long barbel
8 rays

N. africana Fig. 589


2 spines, 11-13 rays
blunt
long barbel
9 or 10 rays

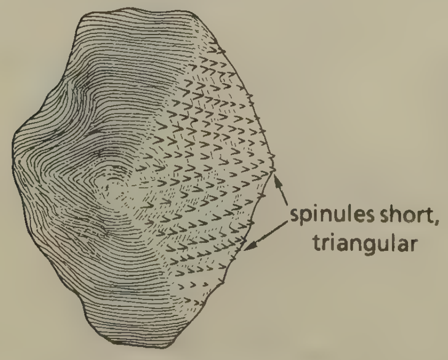
N. atlantica
(after Parr, 1946)

Fig. 590

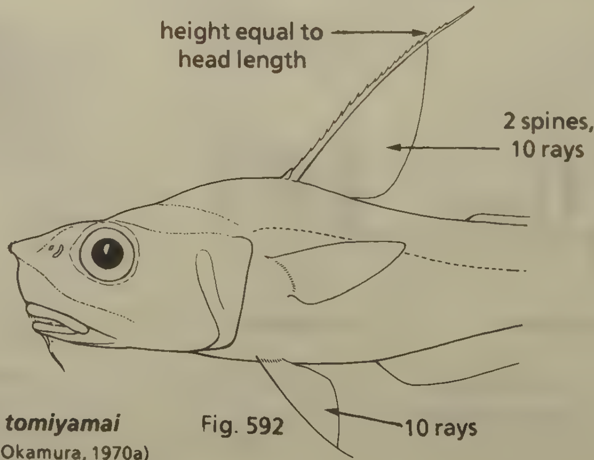

height less than head length
2 spines, 9 or 10 rays
small scales often present on branchiostegal rays
9 or 10 rays

N. stelgidolepis
(after Iwamoto, 1979)

Fig. 591


spinules short, triangular

scale


height equal to head length
2 spines, 10 rays
10 rays

N. tomiyamai
(after Okamura, 1970a)

Fig. 592

10b. Snout acutely pointed, often sharply, protruding well beyond the relatively small, subterminal mouth; suborbital region angular in cross section; barbel short to moderate, less than two-thirds of orbit diameter or less than 21% of head length

14a. First dorsal fin short, about two-thirds of head length or less; small-scale patches usually present on branchiostegal membranes .... ***N. stelgidolepis*** (E.Pacific) (Fig. 591)

14b. First dorsal fin long, three-fourths or more of head length; no scales on branchiostegal membranes

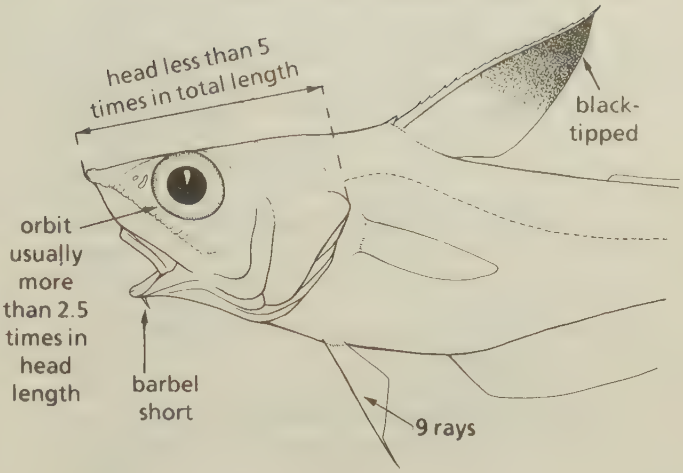
15a. First dorsal with a distinct blackish tip

16a. Barbel short, 6 to 9% of head length; head usually less than 5 times in total length; orbit moderate, 29 to 34% of head length; first dorsal about 75 to 90% of head length; pelvic fins with 9 rays .... ***N. orbitalis*** (E.C.Pacific) (Fig.593)

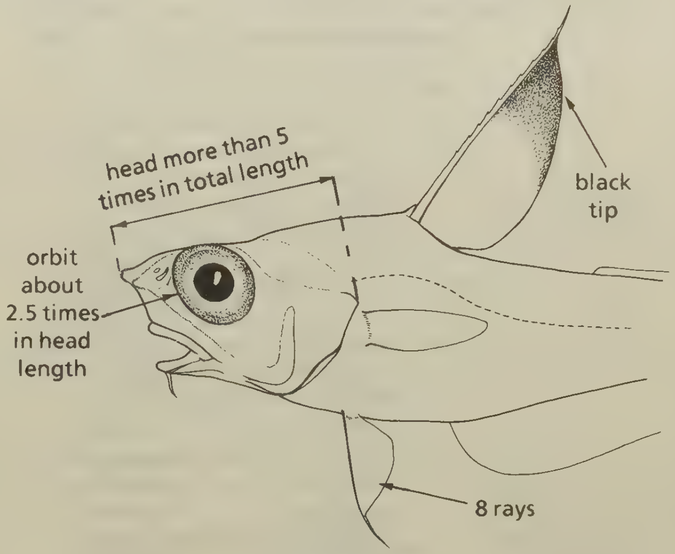
16b. Barbel short to moderate, 9 to 17% of head length; head more than 5 times in total length; orbit moderate to large, 29 to 42% of head length; first dorsal fin 79 to 118% of head length; pelvic fin rays usually 8 or 9

17a. Orbit diameter 40 to 42% of head length; snout 25.5 to 27% of head length; pelvic fin rays 8 .... ***N. milleri*** (S.E. Atlantic) (Fig. 594)

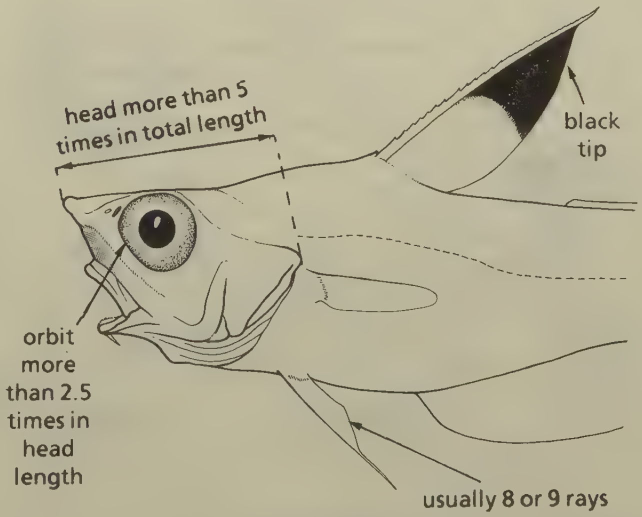
17b. Orbit diameter 29 to 42% (usually less than 40%) of head length; snout 28 to 36% (usually 30 to 33%) of head length; pelvic fin rays 8 or 9 (occasionally 7) .... ***N. aequalis*** (Atlantic) (Fig. 595)


head less than 5 times in total length
black-tipped
orbit usually more than 2.5 times in head length
barbel short
9 rays

N. orbitalis (after Iwamoto, 1979) Fig. 593


head more than 5 times in total length
black tip
orbit about 2.5 times in head length
8 rays

N. milleri (after Iwamoto, 1973) Fig. 594


head more than 5 times in total length
black tip
orbit more than 2.5 times in head length
usually 8 or 9 rays

N. aequalis Fig. 595

15b. First dorsal uniformly dark or dusky

18a. Barbel short, 5 to 10% of head length

19a. Head less than 5 times in total length .... ***N. latirostrata*** (E.C.Pacific) (Fig. 596)

19b. Head more than 5 times in total length .... ***N. cyrano*** (W.C.Atlantic) (Fig. 597)

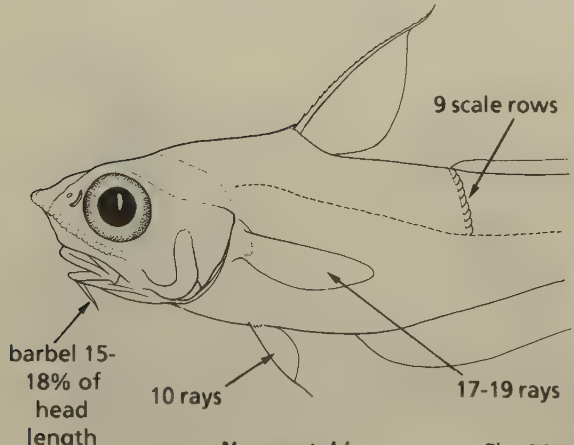
18b. Barbel moderate, 10 to 21% of head length

20a. Pelvic fin rays 9; scale rows below origin of second dorsal 5 to 7.5 .... ***N. proxima*** (S. Japan to Philippines) (Fig. 598)

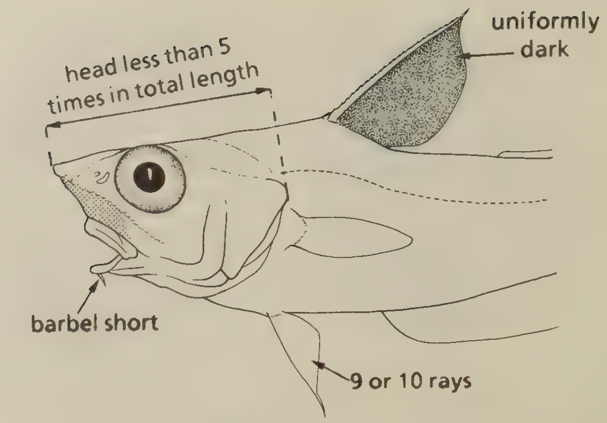
20b. Pelvic fin rays 10 to 12; scales rows below second dorsal 7.5 to 9

21a. Pectoral fin rays 17 to 19; height of first dorsal fin 110 to 111% of head length; barbel 15 to 18% of head length; scales below second dorsal 9; pelvic fin rays 10 .... ***N. namatahi*** (New Zealand) (Fig. 599)

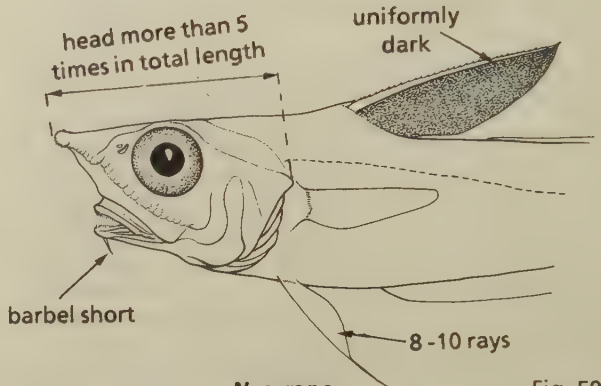
21b. Pectoral fins with 20 to 25 rays; height of first dorsal fin 80 to 101% of head length; barbel 10 to 17% of head length; scales below second dorsal fin 7.5 to 9; pelvic fin rays 10 to 12 .... ***N. loricata*** (E. Pacific: Galapagos, Chile) (Fig. 600)


9 scale rows
barbel 15-18% of head length
10 rays
17-19 rays

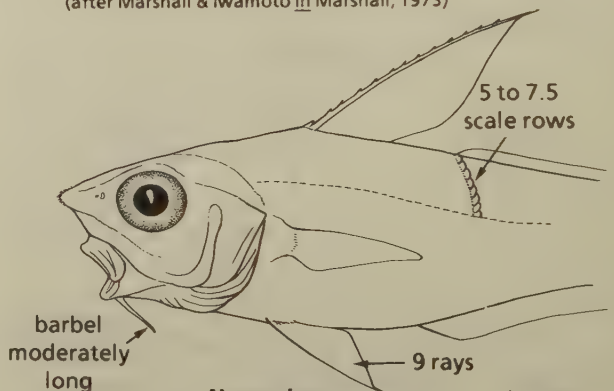
N. namatahi Fig. 599


head less than 5 times in total length
uniformly dark
barbel short
9 or 10 rays

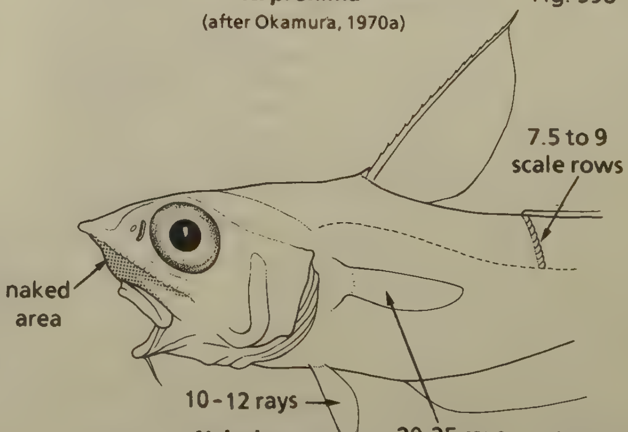
N. latirostrata Fig. 596
(after Iwamoto, 1979)


head more than 5 times in total length
uniformly dark
barbel short
8 -10 rays

N. cyrano Fig. 597
(after Marshall & Iwamoto in Marshall, 1973)


5 to 7.5 scale rows
barbel moderately long
9 rays

N. proxima Fig. 598
(after Okamura, 1970a)


7.5 to 9 scale rows
naked area
10 - 12 rays
20-25 rays

N. loricata Fig. 600
(after Iwamoto, 1979)

Pelvic fin rays 11 to 12 - Group F

Group F

1a. Small circular scales bearing 1 to 15 erect, needle-like spinules (usually in 3 divergent rows) that render the entire body surface velvety; 11 to 14 scale rows below origin of second dorsal fin, about 50 scales in lateral line from its origin over a distance equal to predorsal length; colour uniformly dark brown to blackish; bathypelagic .... ***N. parini***
(E.C. Pacific) (Fig. 577)

1b. Scales not as above; 11 or fewer rows below origin of second dorsal fin, less than 42 scales in lateral line over a distance equivalent to predorsal length; colour variable, from brownish, to greyish, to bluish, but generally not blackish; species benthopelagic

2a. Dorsal fin with spinous second ray greatly prolonged, more than 1.5 times head length .... ***N. infranudis***
(W.C. Pacific) (Fig. 601)

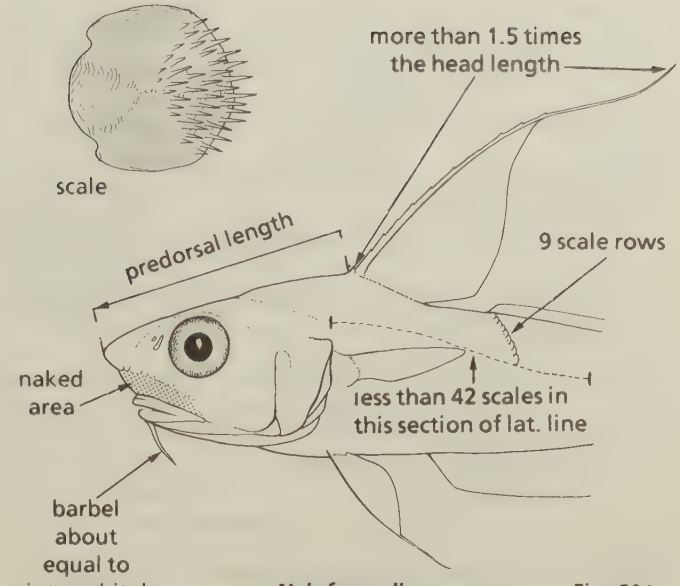
2b. Spinous dorsal fin ray (usually) less than, or about equal to, head length

3a. Scales below second dorsal fin 9.5 to 11; barbel very short, 3 to 5% of head length .... ***N. tinro***
(Mid-North Pacific) (Fig. 602)

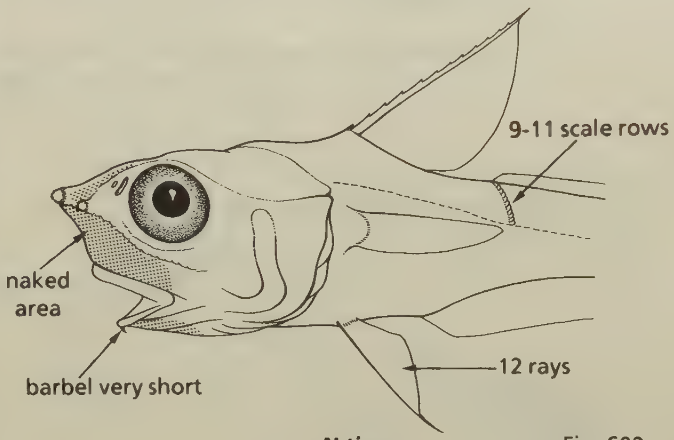
3b. Scales below second dorsal fin 5 to 9.5; barbel short to long, more than 7% of head length

4a. Spinules on body scales lanceolate to shield-shaped

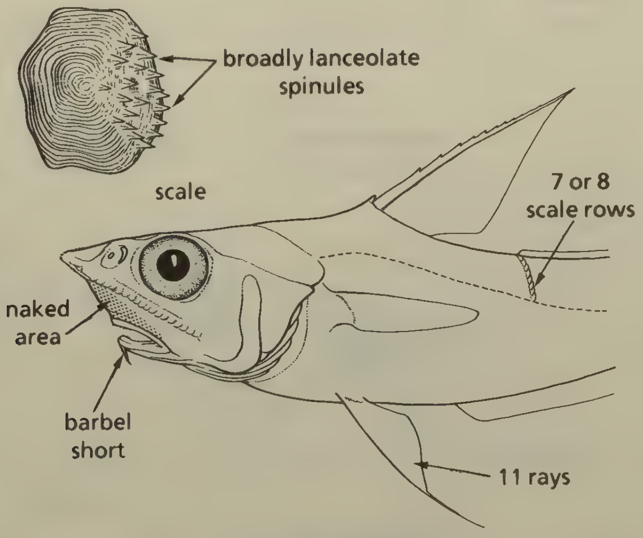
5a. Underside of snout naked as in Fig. 604 a; scales below second dorsal origin 7 or 8 ..... ***N. brevibarbata***
(S. Africa) (Fig. 603)


scale
more than 1.5 times the head length
predorsal length
9 scale rows
naked area
less than 42 scales in this section of lat. line
barbel about equal to interorbital width

N. infranudis
(after Gilbert & Hubbs, 1920)
Fig. 601


9-11 scale rows
naked area
barbel very short
12 rays

N.tinro
(after Sazonov, 1985)
Fig. 602


broadly lanceolate spinules
scale
7 or 8 scale rows
naked area
barbel short
11 rays

N. brevibarbata
(after Iwamoto in Smith & Heemstra, 1986)
Fig. 603

5b. Underside of snout naked as in Fig. 604b; scales below second dorsal origin 7.5 to 9 .... ***N. loricata*** (E. Pacific: Galapagos, Chile) (Fig. 600)

4b. Spinules on body scales conical to needlelike (Fig. 605)*

6a. Gill rakers on lower limb of first arch 5 to 7 (total rakers 7 to 9) .... ***N. convergens*** (E. Pacific: Mexico to Chile) (Fig. 606)

6b. Gill rakers on lower limb of first arch 8 or more (total rakers 9 to 13)*

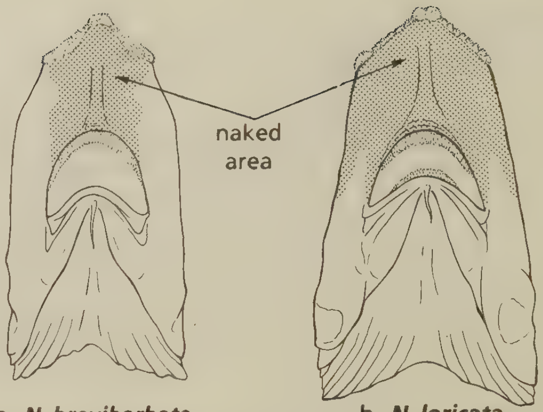
7a. Spinules on body scales long, needlelike, greatly extended beyond posterior scale margin; scales below second dorsal fin about 9.5; barbel 15 to 23% of head length .... ***N. semiquincunciata*** (Indian Ocean) (Fig. 607)

7b. Spinules on body scales short, conical, little if at all extended beyond scale margin; scales below second dorsal fin 5 to 9; barbel 8 to 16% of head length*

8a. Scales below second dorsal 9 .. ***N. obliquata*** (Hawaii) (Fig. 608)

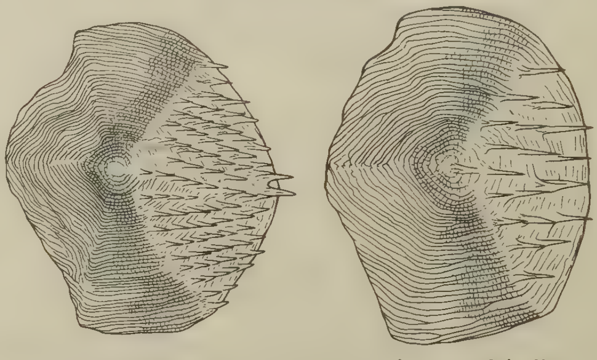
---

* Condition not known in ***N. obliquata***

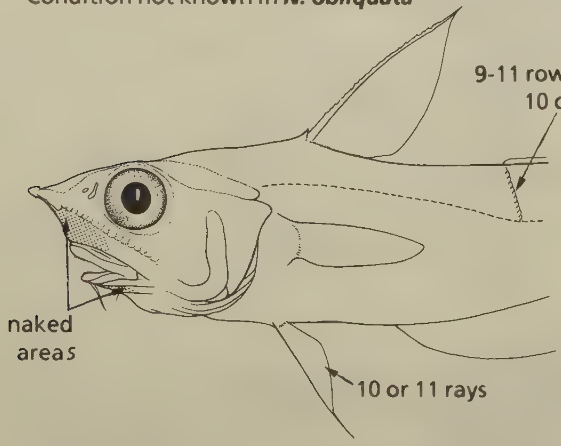


a. ***N. brevibarbata*** b. ***N. loricata***

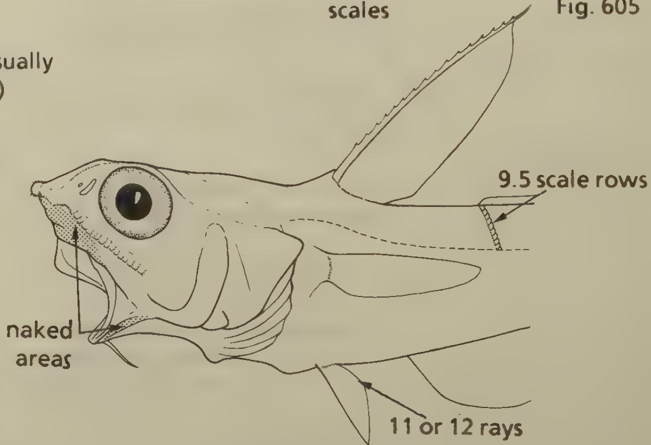
underside of head Fig. 604


a. ***N. convergens*** b. ***N. pulchella***

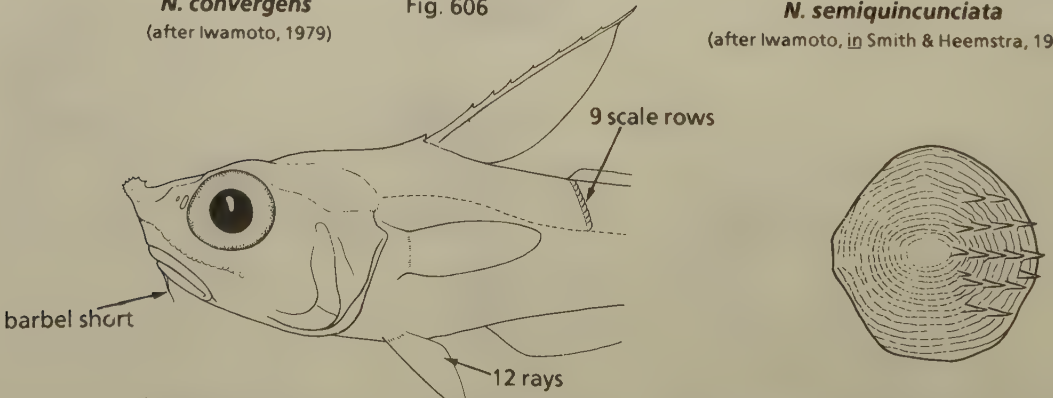
scales Fig. 605


9-11 rows (usually
10 or 11)
naked
areas
10 or 11 rays

N. convergens Fig. 606
(after Iwamoto, 1979)


9.5 scale rows
naked
areas
11 or 12 rays

N. semiquincunciata Fig. 607
(after Iwamoto, in Smith & Heemstra, 1986)


9 scale rows
barbel short
12 rays

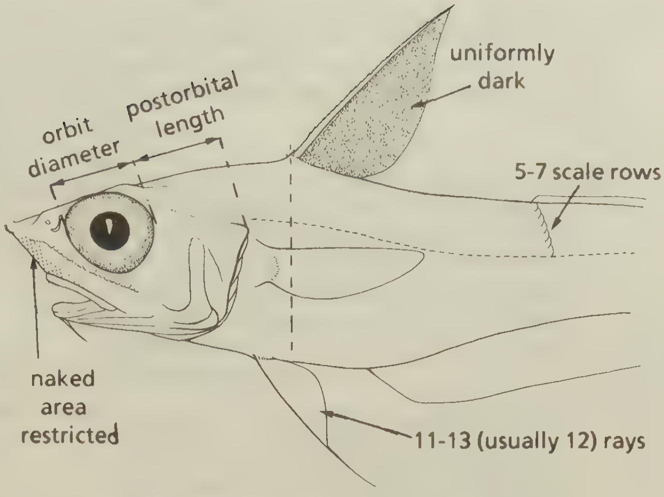
a. lateral view b. scale

N. obliquata Fig. 608
(after Gilbert, 1905)

8b. Scales below second dorsal 5 to 7.5

9a. Origin of first dorsal fin well behind posterior edge of opercle; underside of head below orbits mostly scaled; gill membranes greatly restricted across isthmus; orbit into postorbital length 1.04 to 1.18 times .... ***N. duodecim*** (E.C. Atlantic) (Fig. 609)

9b. Origin of first dorsal fin over posterior edge of opercle; underside of head almost completely naked from snout tip to below posterior edge of orbits; gill membranes little restricted across isthmus; orbit in postorbital length about 1.20 to 1.50 times ..... ***N. pulchella*** (S.E. Pacific) (Fig. 610)


uniformly
dark
orbit
diameter
postorbital
length
5-7 scale rows
naked
area
restricted
11-13 (usually 12) rays

N. duodecim Fig. 609
(after Iwamoto, 1979)

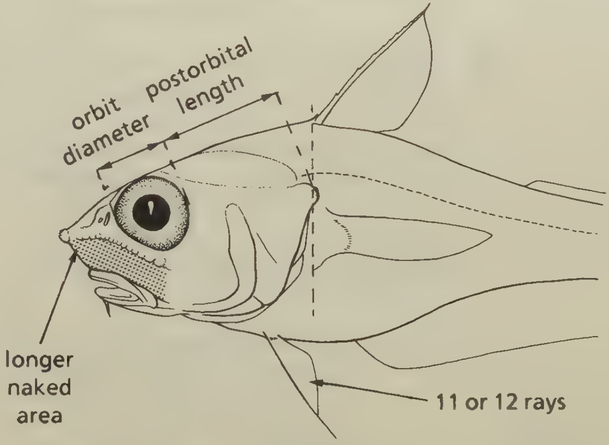
Pelvic fin rays 12 or more - Group G

Group G

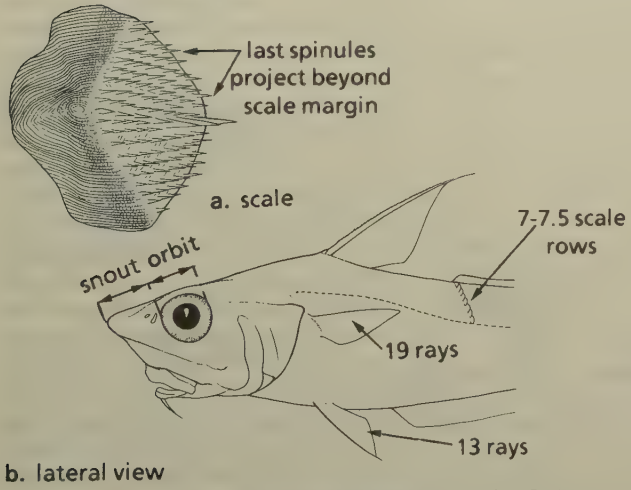
1a. Spinules on body scales dense, with numerous parallel to somewhat convergent rows (15 to 22 in adults) of long, needlelike spinules, the median row larger, the last spinule in row projecting well beyond scale margin (Fig. 611a)

2a. Scale rows below origin of second dorsal fin 7 or 7.5; snout pointed, strongly protruding beyond mouth, its length considerably greater than orbit diameter .... ***N. kamoharai*** (Japan) (Fig. 611b)

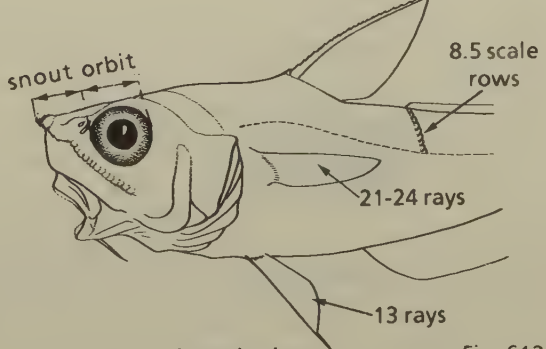
2b. Scale rows below origin of second dorsal fin 8.5; snout blunt, little protruding beyond mouth, its length about equal to orbit diameter ...... ***N. longebarbata*** (N. Atlantic, Gulf of Mexico) (Fig. 612)


orbit
diameter
postorbital
length
longer
naked
area
11 or 12 rays

N. pulchella Fig. 610
(after Iwamoto, 1979)


last spinules
project beyond
scale margin
a. scale
snout
orbit
7-7.5 scale
rows
19 rays
13 rays
b. lateral view

N. kamoharai Fig. 611
(after Okamura, 1970a)


snout
orbit
8.5 scale
rows
21-24 rays
13 rays

N. longebarbata Fig. 612
(after Marshall & Iwamoto in Marshall, 1973)

1b. Spinules relatively short, dense to sparse, usually in 16 or fewer rows in adults, median row not enlarged, posteriormost spinules scarcely or not at all protruding beyond scale margin

3a. Scales highly deciduous; mandibles and underside of head from below orbits and posteriorly scaled; interspace between dorsal fins 49 to 73% of head length; scale rows below second dorsal origin 5 to 7; first dorsal fin uniformly dark .... ***N. duodecim*** (E.C. Atlantic) (Fig. 609)

3b. Scales relatively adherent; underside of head almost entirely naked to posterior angle of mouth; mandibles naked; scale rows below origin of second dorsal fin 9 to 13; first dorsal with a distinct black blotch at tip or uniformly dark

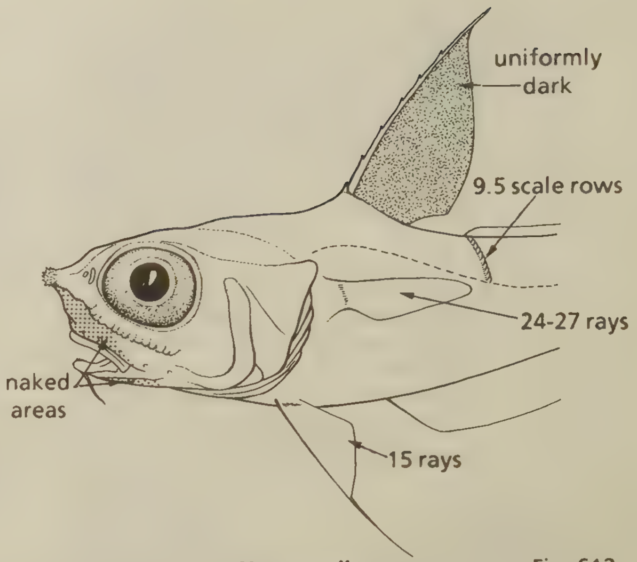
4a. Pectoral fin rays 24 to 27; first dorsal uniformly darkish .... ***N. ventralis*** (Galapagos) (Fig. 613)

4b. Pectoral fin rays 19 to 23; first dorsal fin with a distinct black blotch at tip

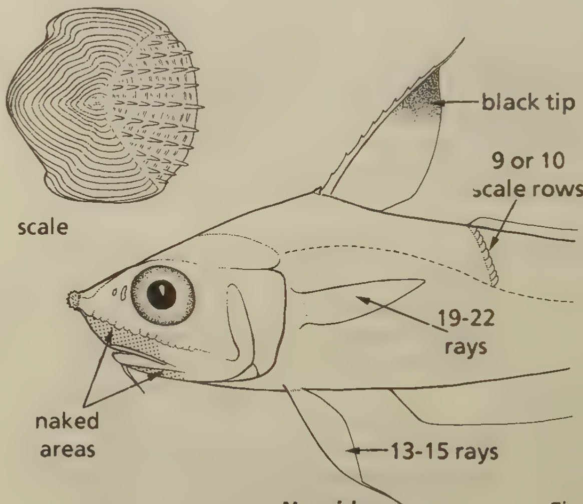
5a. Scale rows below second dorsal fin 9 or 10 .... ***N. evides*** (W.C. Pacific) (Fig. 614)

5b. Scale rows below second dorsal fin 10.5 to 12.5

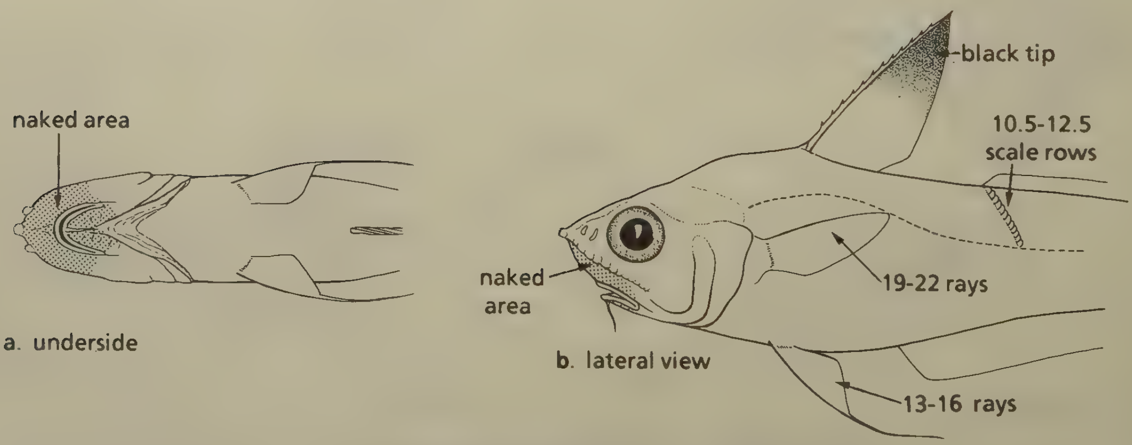
6a. Pelvic fin rays 13 to 16; pectoral fin 51 to 61% of head length; distance from anus to anal fin origin 15 to 20% of head length .... ***N. condylura*** (S. Japan to E. China Sea) (Fig. 615)


uniformly dark
9.5 scale rows
24-27 rays
naked areas
15 rays

N. ventralis Fig. 613
(after Iwamoto, 1979)


black tip
9 or 10 scale rows
scale
19-22 rays
naked areas
13-15 rays

N. evides Fig. 614
(after Gilbert & Hubbs, 1920)

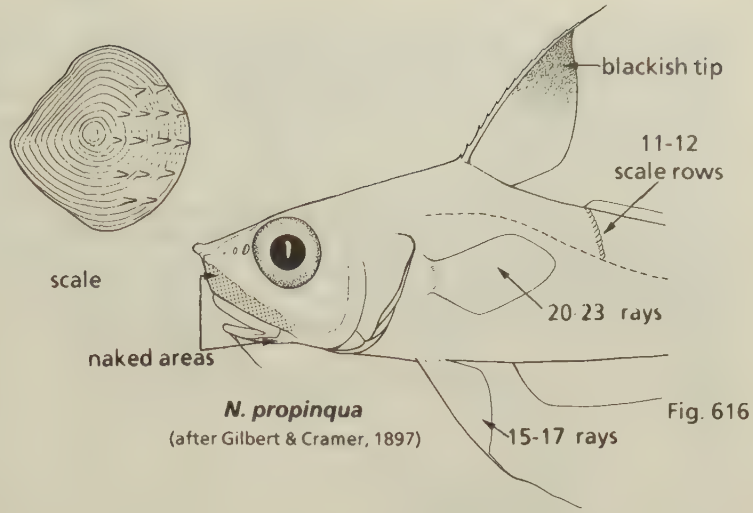

naked area
black tip
10.5-12.5 scale rows
naked area
19-22 rays
13-16 rays

a. underside

b. lateral view

N. condylura Fig. 615
(after Okamura, 1970a)

6b. Pelvic fin rays 15 to 17; pectoral fin 60 to 67% of head length; distance from anus to anal fin origin 21 to 25% of head length .... ***N. propinqua***
(Hawaii, W. Pacific, W. Indian Ocean)
(Fig. 616)



N. propinqua
(after Gilbert & Cramer, 1897)

Fig. 616

List of Species

Nezumia aequalis (Günther, 1878)
Nezumia africana (Iwamoto, 1970)
Nezumia atlantica (Parr, 1946)
Nezumia bairdii (Goode & Bean, 1877)
Nezumia brevibarbata (Barnard, 1925)
Nezumia brevirostris (Alcock, 1889)
Nezumia bubonis Iwamoto, 1974
Nezumia burragei (Gilbert, 1905)
Nezumia condylura Jordan & Gilbert, 1902
Nezumia convergens (Garman, 1899)
Nezumia cyrano Marshall & Iwamoto, 1973
Nezumia dara Gilbert & Hubbs, 1916
Nezumia duodecim Iwamoto, 1970
Nezumia ectenes (Gilbert & Cramer, 1897)
Nezumia evides (Gilbert & Hubbs, 1920)
Nezumia hebetata (Gilbert, 1905)
Nezumia holocentra (Gilbert & Cramer, 1897)
Nezumia infranudis (Gilbert & Hubbs, 1920)
Nezumia investigatoris (Alcock, 1889)
Nezumia kamoharai Okamura, 1970
Nezumia latirostrata (Garman, 1899)
Nezumia leonis (Barnard, 1925)
Nezumia liolepis (Gilbert, 1890)
Nezumia longebarbata (Roule & Angel, 1933)
Nezumia loricata (Garman, 1899)
Nezumia macronema (Smith & Radcliffe, 1912)
Nezumia micronychodon Iwamoto, 1970
Nezumia milleri Iwamoto, 1973
Nezumia namatahi McCann & McKnight, 1980
Nezumia obliquata (Gilbert, 1905)
Nezumia orbitalis (Garman, 1899)
Nezumia parini Hubbs & Iwamoto, 1977
Nezumia polylepis (Alcock, 1889)
Nezumia propinqua (Gilbert & Cramer, 1897)
Nezumia proxima (Smith & Radcliffe, 1912)
Nezumia pudens Gilbert & Thompson, 1916
Nezumia pulchella (Pequeño, 1971)
Nezumia sclerorhynchus (Valenciennes, 1838)
Nezumia semiquincunciata (Alcock, 1889)
Nezumia spinosa (Gilbert & Hubbs, 1916)
Nezumia stelgidolepis (Gilbert, 1890)
Nezumia suilla Marshall & Iwamoto, 1973
Nezumia tinro Sazonov, 1985
Nezumia toi McCann & McKnight, 1980
Nezumia tomiyamai (Okamura, 1963)
Nezumia ventralis Hubbs & Iwamoto, 1979

Nezumia aequalis (Günther, 1878)

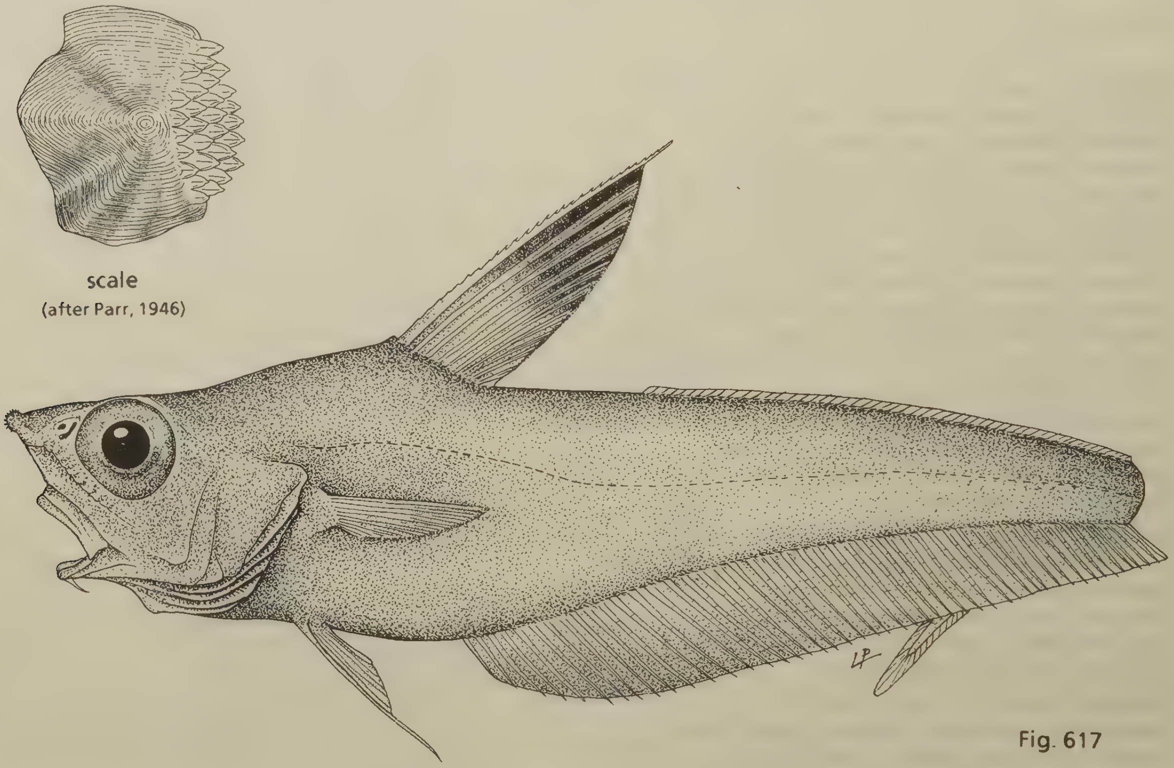
Fig. 617

MACROUR Nez 1

Scientific Name with Reference : ***Coryphaenoides aequalis*** Günther, 1878, Ann. Mag. Nat. Hist., ser. 5, 2: 25 (south of Portugal, 1097 m).

Synonyms : ?***Macrurus serratus*** Lowe, 1843; ?***Coryphaenoides serratus*** -- Günther, 1862; ***Macrurus aequalis*** -- Günther, 1887; ***Macrurus smiliophorus*** Vaillant, 1888; ***Coryphaenoides (Macrurus) aequalis*** -- Collett, 1905; ***Lionurus (Nezumia) aequalis*** -- Gilbert & Hubbs, 1916; ***Macrurus serratus*** -- Roule, 1919; ***Macruroplus serratus*** -- Fowler, 1936; ***Macrurus holotrachys*** -- Hildebrand in Longley & Hildebrand, 1941 (non ***Macrourus holotrachys*** Günther); ***Nezumia hildebrandi*** Parr, 1946; ***Nezumia aequalis*** -- Maul, 1951; ***Nezumia (Lionurus) aequalis*** -- Cadenat, 1961.

FAO Names : En - Common Atlantic grenadier.



scale
(after Parr, 1946)

Fig. 617

Diagnostic Features : Snout short, acute, 26 to 34% of head length; orbits large 29 to 42%; naked area on ventral surface of snout confined to narrow median-ventral strip, otherwise head surfaces completely scale-covered; head pores relatively small and inconspicuous; inner gill rakers on first arch 1 or 2 + 8 to 10. Teeth small, in moderately wide bands in both jaws. First dorsal fin with 2 spines and 9 to 12 rays; pectoral fin rays i17 to i20; pelvic fin rays 9 (usually 8 or 9, depending on population). Measurements in percentages of head length: orbit diameter 29 to 42; interorbital space 17 to 25; upper jaw 28 to 36; orbit to angle of preopercle 32 to 38; barbel 10 to 17. Pyloric caeca 20 to 28. Body scales with lanceolate to shield-shaped spinules; scales below second dorsal fin 7 to 9; lateral- line scales over distance equal to preodorsal length 32 to 37. **Colour**: bluish to violet, head somewhat tawny to swarthy; silvery reflections on ventral 2/3 of body when fresh; pelvic fins black except outermost ray pale to white; pectoral fins dusky; anal fin black anteriorly, fading to dusky or clear posteriorly; first dorsal fin black on distal 1/3; mouth greyish, gill cavity mostly black.

Geographical Distribution : Widespread in North Atlantic, from Faroe Bank to northern Angola and the Mediterranean Sea in the east, and Davis Straits to northern Brazil in the west (Fig. 618).

Habitat and Biology : Benthopelagic in approximately 200 to 1000 m depth. Feeds on small crustaceans (mysids, amphipods, etc.) and polychaetes.

Size : To about 30 cm total length.

Interest to Fisheries : Often caught in moderate quantities; taken as bycatch by offshore trawlers throughout its range. Mostly reduced to fish meal and oil.

Literature : Günther (1887); Koefoed (1910); Parr (1946); Poll (1953); Iwamoto (1970); Marshall & Iwamoto in Marshall (1973).

Remarks : Populations of this widespread North Atlantic species have been distinguished by Marshall and Iwamoto (in Marshall, 1973). The Gulf of Guinea population is the most distinct of these and probably deserves subspecific recognition at the least. The population in the Gulf of Mexico, although less well defined, also deserves consideration at the subspecific level.

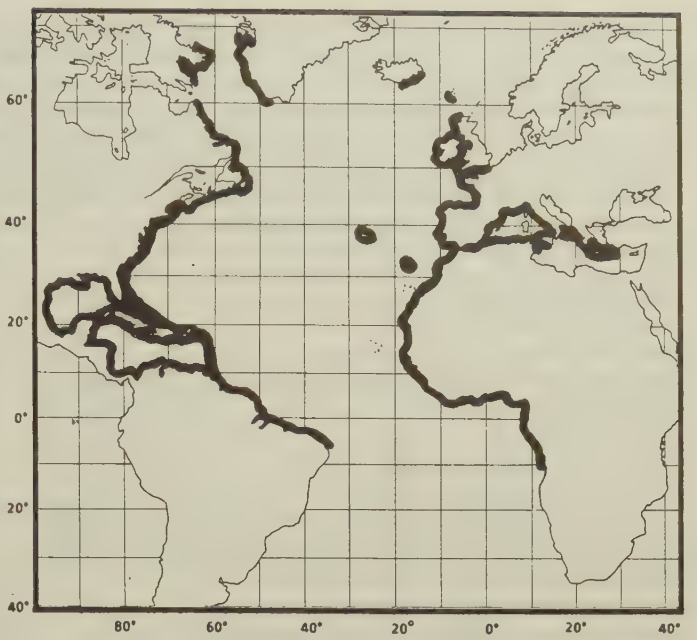


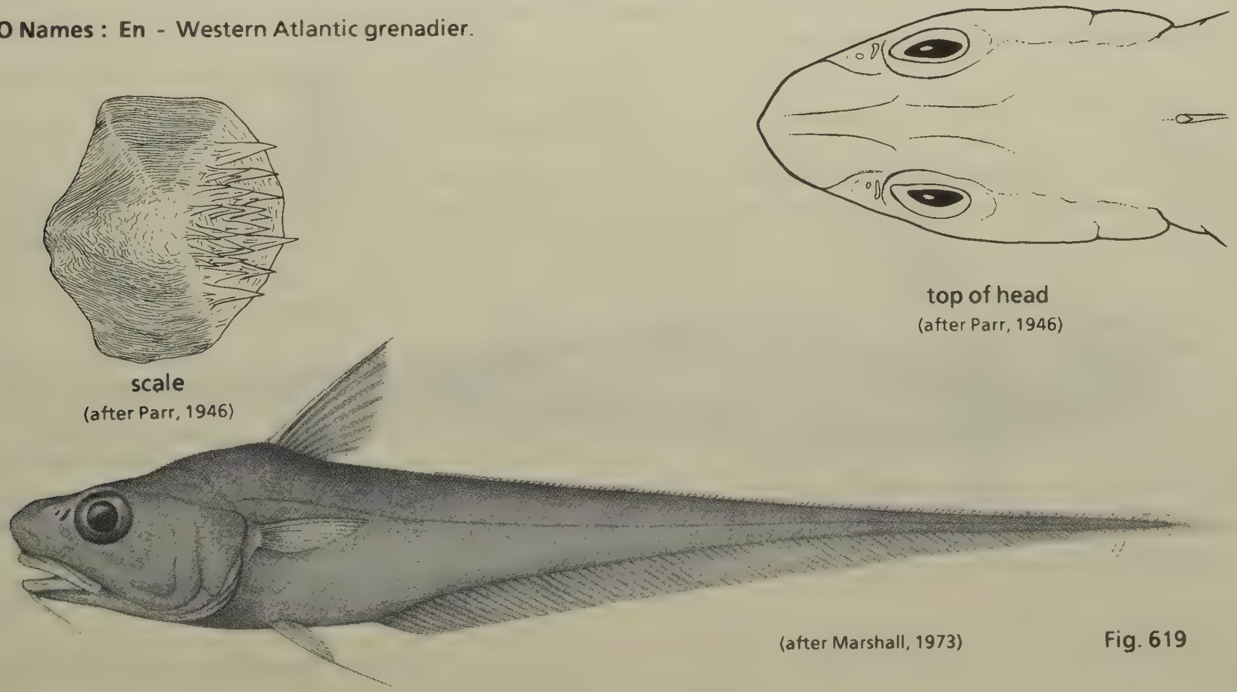
Fig. 618

Nezumia atlantica (Parr, 1946) Fig. 619 **MACROUR Nez 2**

Scientific Name with Reference : ***Ventrifossa atlantica*** Parr, 1946. Bull. Bingham Oceanogr. Coll., 10 (art. 1): 32, fig. 9, 10 (northern Gulf of Mexico, 345 to 500 fm).

Synonyms : ***Nezumia atlantica*** -- Arai in Uyeno et al., 1983.

FAO Names : En - Western Atlantic grenadier.



scale
(after Parr, 1946)

top of head
(after Parr, 1946)

(after Marshall, 1973)

Fig. 619

Diagnostic Features : Snout narrow, bluntly rounded, scarcely produced, its underside naked; terminal and lateral snout scutes broad, blunt; suborbital region flat, vertical. Teeth in broad bands; outer series of upper jaw enlarged, teeth do not extend to end of rictus. Inner gill rakers of first arch 1 or 2 + 8 or 9 [10 or 11 total]. First dorsal fin with 2 spines and 10 to 13 rays; pectoral fin rays i19 to i23; pelvic fin rays 9 or 10. Measurements in percentages of head length: snout length 24 to 29, snout height 12 to 17; orbit diameter 27 to 31; interorbital space 19 to 22; upper jaw 38 to 45; least suborbital width 11 to 14; orbit to angle of preopercle 39 to 43; barbel 20 to 29; outer gill slit 15 to 21. Spinules on body scales numerous, lanceolate, arranged in 8 to 10 subparallel rows in larger specimens; scales below second dorsal fin 8 to 9; lateral-line scales over distance equal to predorsal length 37 to 45. **Colour:** uniformly deep brownish black overall; fins blackish.

Geographical Distribution : Abundant in the tropical western Atlantic (Fig. 620).

Habitat and Biology : Benthopelagic in 366 to 1097 m depth.

Size : To at least 45 cm total length.

Interest to Fisheries : Probably taken in bycatch of deep-water trawl fishery for royal red shrimp of western central Atlantic, but not known to be utilized.

Local Names : JAPAN: Nishi-nezumidara.

Remarks : Parr (1946); Marshall (1973); Arai (in Uyeno Matsuura & Fujii, 1983).

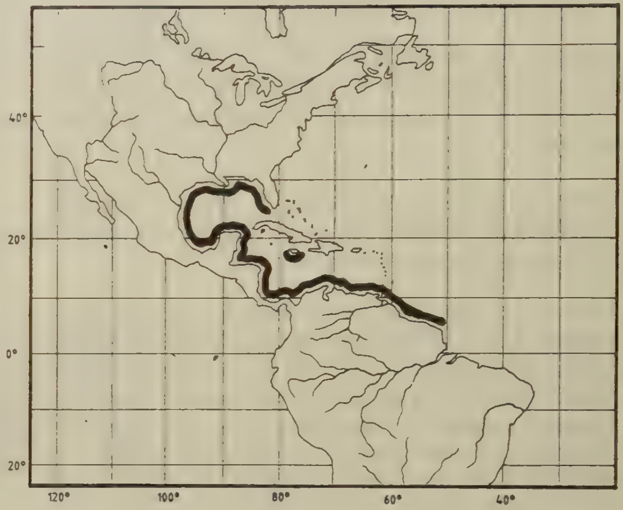


Fig. 620

Nezumia bairdi (Goode & Bean, 1877)

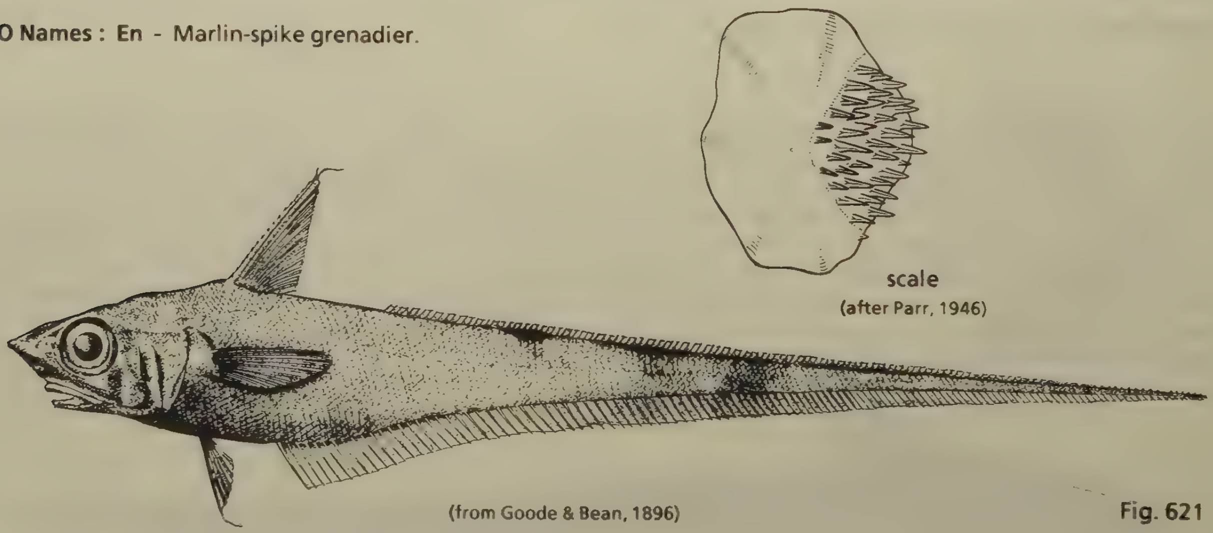
Fig. 621

MACROUR Nez 3

Scientific Name with Reference : ***Macrurus bairdii*** Goode & Bean, 1877, Amer. J. Sci. Arts, 14: 471 (Gulf of Maine, 44 mi. ese of Cape Ann; 293 m).

Synonyms : ***Lionurus (Nezumia) bairdii*** -- Gilbert & Hubbs, 1916; ***Coryphaenoides bairdii*** -- Schroeder, 1940; ***Nezumia bairdi*** -- Parr, 1946.

FAO Names : En - Marlin-spike grenadier.



scale
(after Parr, 1946)

(from Goode & Bean, 1896)

Fig. 621

Diagnostic Features : Snout acutely pointed naked area on underside of snout confined to median-ventral strip, otherwise head surfaces completely scale covered; head pores well developed on lower margins of suborbital and preopercle. Teeth small, in wide, tapered bands in both jaws, outer series in upper jaw enlarged; bands extend to end of rictus. Inner gill rakers on first arch 8 to 10 total. First dorsal fin with 2 spines and 9 to 11 rays; pectoral fin rays i16 to i19; pelvic fin rays 7 (rarely 6). Measurements in percentages of head length: snout length 30 to 33; orbit diameter 30 to 34; interorbital space 26 to 29; upper jaw 30 to 33; orbit to angle of preopercle 34 to 37; barbel 12 to 15. Scale spinules slender, conical to lanceolate, arranged in convergent rows; scales below second dorsal fin 7 to 9; lateral-line scales over a distance equal to predorsal length 37 to 41. **Colour:** fresh specimens grey with violet hue on trunk and lower jaw; silvery reflections on gill cover, parts of suborbital, and trunk and tail below lateral line; pelvic fins and membrane between spinous dorsal ray and first segmented ray black; pectoral and median fins otherwise dusky; oral and gill cavities mostly black.

Geographical Distribution : Western North Atlantic, from New Foundland to the northern end of the Straits of Florida. One northeastern Atlantic specimen (36°47'N, 27°21'W) reported by Geistdoerfer, Hureau, & Rannou (1970) should be reexamined; its capture depth of 3520 m is well beyond the normal range of the species (90 to 700 m). Roule & Angel (1933) reported a specimen from the Azores, but their count of 8 pelvic rays suggests that it represents another species. Records of the species from the Gulf of Mexico and West Indies probably refer to other species, especially ***N. suilla***, which also has 7 pelvic fin rays (Fig. 622).

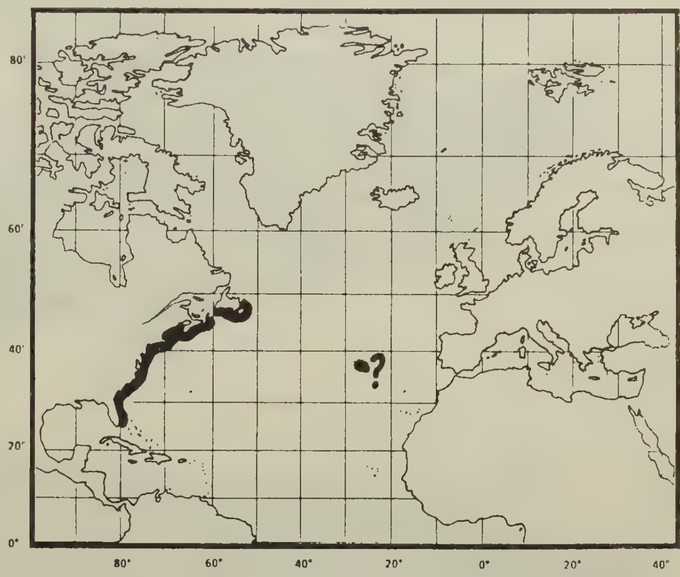


Fig. 622

Habitat and Biology : Benthopelagic, most commonly in 90 to 700 m depth, but taken much shallower in areas with cold surface waters: one was trawled in Vineyard Sound, Massachusetts, in 16.5 m depth; another was taken in a weir at Lubec, Maine. It has been reported as deep as 2295 m, but records deeper than 1000 m should be viewed sceptically. In the Gulf of Maine, it breeds during summer and autumn Feeds primarily on euphausiids, amphipods, and polychaetes, although a 200 mm individual had many copepods in its stomach.

Size : To about 40 cm total length.

Interest to Fisheries : The most common grenadier in shallow slope waters of the western North Atlantic. Sometimes caught in moderate quantities as bycatch of trawlers.

Local Names : USA: Marlin-spike, Common grenadier, Rat-tail.

Literature : Goode & Bean (1896); Parr (1946); Bigelow & Schroeder (1953); Marshall & Iwamoto in Marshall (1973).

Remarks : This species is immediately distinguished from its Atlantic congeners by the combination of pelvic fin rays 7, first dorsal fin pale except for black membrane between second spinous dorsal and first segmented rays, conical to lanceolate scale spinules, and relatively restricted naked area on snout.

Nezumia brevibarbata (Barnard, 1925)

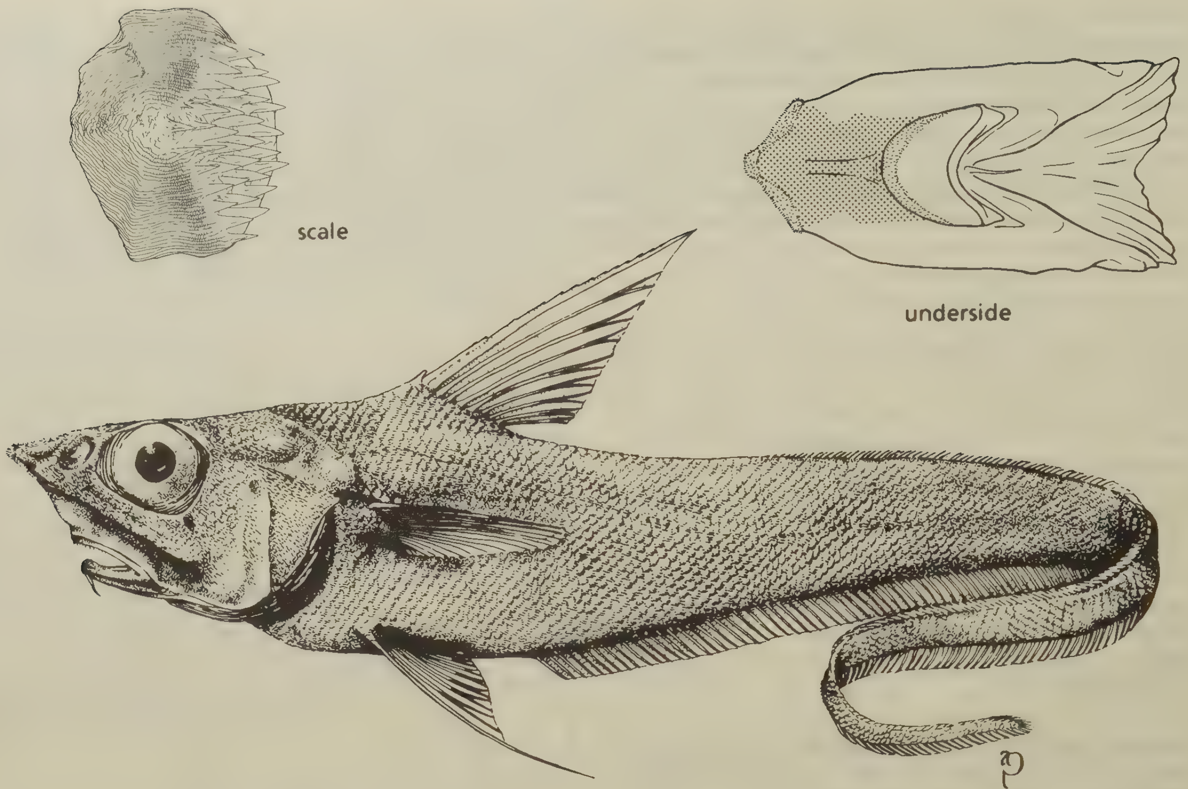
Fig. 623

MACROUR Nez 4

Scientific Name with Reference : ***Lionurus brevibarbatus*** Barnard, 1925a, Ann. Mag. Nat. Hist. ser. 9, 15: 503 [off Cape Point, South Africa, 300-950 fms].

Synonyms : ***Macruroplus brevibarbatus*** -- Smith, 1949; ***Nezumia brevibarbatus*** -- Marshall & Iwamoto in Marshall, 1973.

FAO Names : En - Shortbeard grenadier.



(from Iwamoto, in Smith & Heemstra, 1986)

Fig. 623

Diagnostic Features : Snout acutely pointed; terminal scute well developed, but not especially set off from adjacent scales; undersides of snout, most of suborbital, and anterior part of mandible mostly naked. Teeth in moderately wide bands, outer series in upper jaw slightly enlarged. Inner gill rakers on first arch usually 1 or 2 + 10 or 11 (12 total), outer gill rakers on second arch 1 + 9 or 10. First dorsal fin with 2 spines and 9 to 11 rays, serrations on second spine slender, rather widely spaced; pectoral fin rays i18 to i20; pelvic fin rays 11. Measurements in percentages of head length: snout 32 to 35; orbit diameter 33 to 34; interorbital space 21 to 25; upper jaw 30 to 32; orbit to angle of preopercle 34 to 35; barbel 11 to 12. Pyloric caeca about 30. Spinules on body scales broadly lanceolate to shield-shaped in somewhat converging rows; scales below second dorsal fin 7 or 8; lateral-line scales over a distance equal to predorsal length 35 to 40. **Colour:** brownish, violaceous over abdomen; gill membranes blackish; fins dusky.

Geographical Distribution : South Africa off Cape Point. Possibly more widely distributed in southern Africa, but nowhere taken in abundance (Fig. 624).

Habitat and Biology : Benthopelagic in 549 to 1737 m depth.

Size : To about 26 cm total length.

Interest to Fisheries : Probably not of much commercial interest because of the small size and relative scarcity.

Literature : Barnard (1925a); Iwamoto (in Smith & Heemstra, 1986).

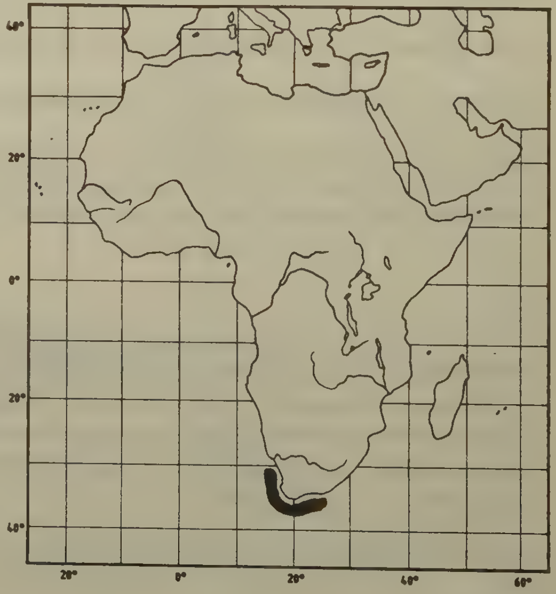


Fig. 624

Nezumia condylura Jordan & Gilbert, 1904

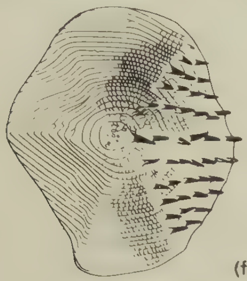
Fig. 625

MACROUR Nez 5

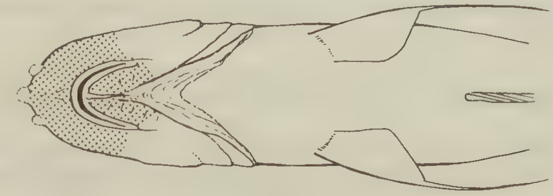
Scientific Name with Reference : ***Nezumia condylura*** Jordan & Gilbert, in Jordan & Starks, 1904: Bull. U.S. Fish Comm. (1902) 22: 620, pl. 4, fig. 2 (Suruga Bay, Japan; 379 to 457 m; ALBATROSS sta. 3721).

Synonyms : ***Lionurus (Nezumia) condylura*** -- Gilbert & Hubbs, 1916.

FAO Names : **En** - Pugnose grenadier.



scale
(from Okamura, 1970a)



underside
(after Okamura, 1970a)

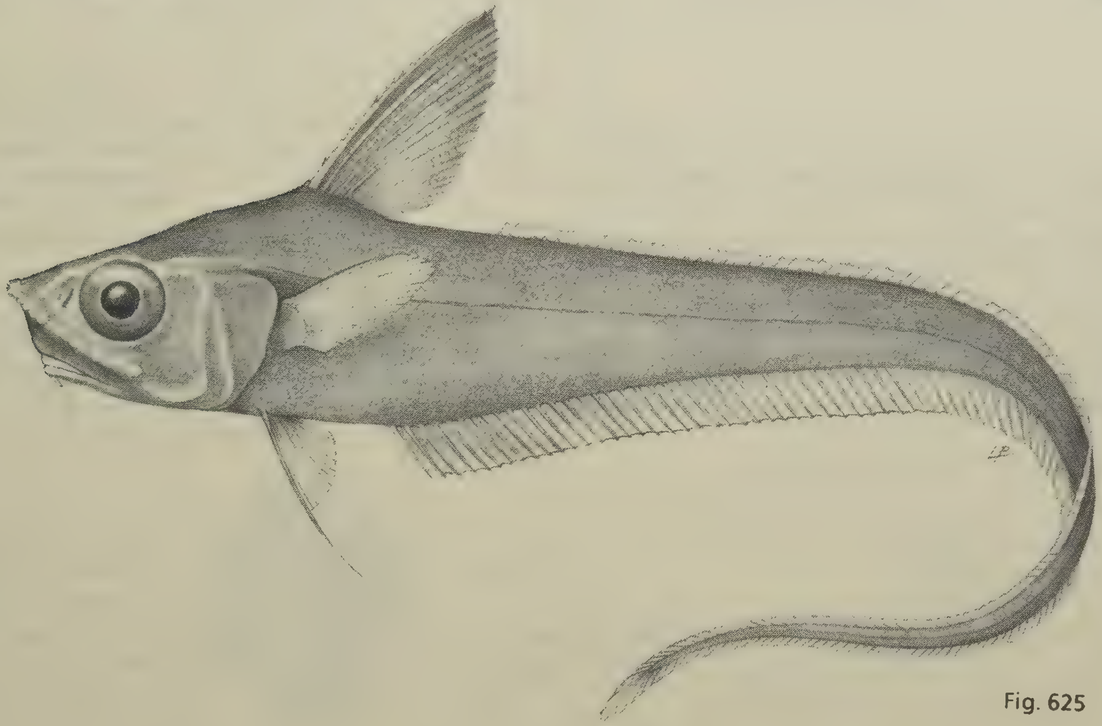


Fig. 625

Diagnostic Features : Snout short, blunt; terminal and lateral snout scutes large, blunt; undersides of snout, mandible, most of suborbital, and part of lower margin of preopercle naked; pores prominent in these areas. Teeth in rather broad, tapered bands, outer series in upper jaw slightly enlarged. Inner gill rakers on first arch usually 1 or 2 + 7 or 8 (8 to 10 total). First dorsal fin with 2 spines and 10 to 12 rays, serrations on second spine slender and rather widely spaced; pectoral fin rays i18 to i21; pelvic fin rays 13 to 17. Measurements in percentages of head length: snout length 28 to 30; orbit diameter 29 to 36; interorbital space 23 to 25; upper jaw 29 to 33; orbit to angle of preopercle 32 to 38; barbel 14 to 21. Pyloric caeca 25 to 28. Scales small, spinules on body scales sharp, needlelike, greatly reclined, in 4 to 16 parallel rows; scales below midbase of first dorsal fin 8 or 9, below second dorsal fin 12 or 13. **Colour:** greyish brown, bluish over abdomen; gill membranes blackish; fins dusky, first dorsal fin blackish distally; oral and branchial linings blackish.

Geographical Distribution : Southern Japan, East China Sea (Fig. 626).

Habitat and Biology : Benthopelagic in 200 to 720 m depth, but uncommon shallower than 400 m. Frequents waters of 5 to 7°C. Polychaetes and euphausiids compose 30 to 60% of the diet of specimens from Japan, with prawns of minor importance.

Size : To about 21 cm total length.

Interest to Fisheries : A common, but small species taken as by-catch by trawlers in southern Japan; no catch statistics are available.

Local Names : JAPAN: Nezumi-dara.

Literature : Jordan & Gilbert (in Jordan & Starks, 1904); Gilbert & Hubbs (1916); Okamura (1970a); Okamura (in Okamura et al. 1982).

Remarks : This species may be a synonym of ***N. propinqua*** from Hawaii.

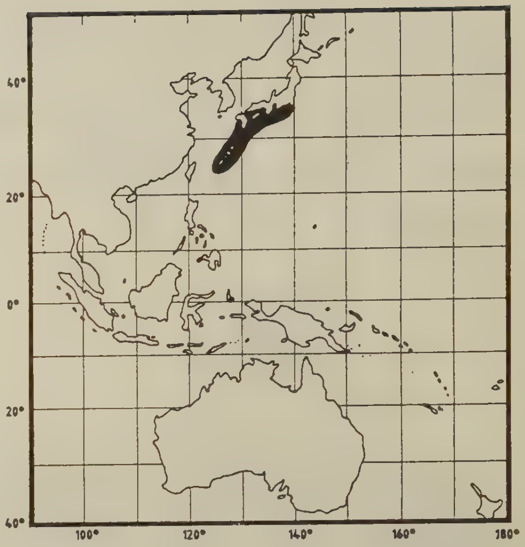


Fig. 626

Nezumia convergens (Garman, 1899)

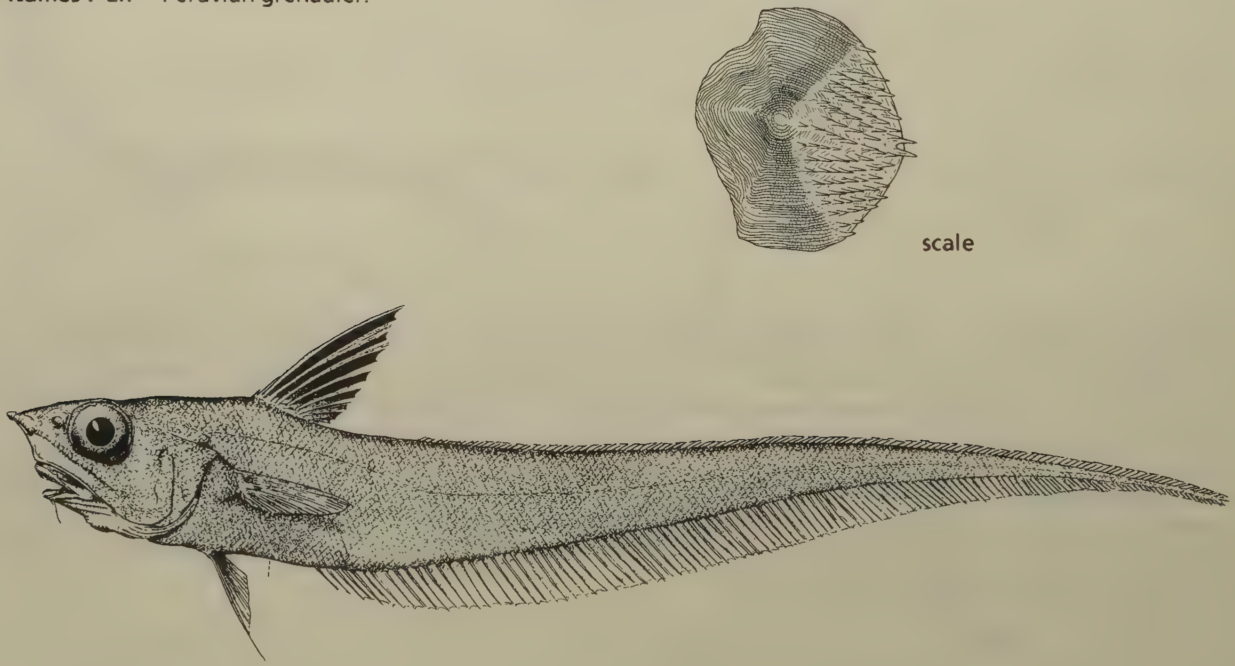
Fig. 627

MACROUR Nez 6

Scientific Name with Reference : ***Macrurus convergens*** Garman, 1899, Mem. Mus. Comp. Zool. Harvard 24: 210, pl. 48, fig. 1 (Gulf of Panama; 1271 to 1865 m; ALBATROSS sta. 3353, 3357, 3393).

Synonyms : ***Macrurus cuspidatus*** Garman, 1899; ***Macrurus trichiurus*** Garman, 1899; ***Lionurus (Nezumia) convergens*** -- Gilbert & Hubbs, 1916; ***Lionurus (Nezumia) cuspidatus*** -- Gilbert & Hubbs, 1916; ***Lionurus (Nezumia) trichiurus*** -- Gilbert & Hubbs, 1916; ***Nezumia convergens*** -- Makushok, 1967; ***Nezumia cuspidata*** -- Makushok, 1967; ***Nezumia trichiura*** -- Makushok, 1967; ***Sphagemacrurus trichiurus*** -- Marshall, 1973.

FAO Names : En - Peruvian grenadier.



(from Iwamoto, 1979)

Fig. 627

Diagnostic Features : Snout moderately pointed; terminal and lateral snout scutes stout; underside of snout and suborbital anteriorly naked; mandibular rami naked anteriorly; cephalic pores of lateralis system small. Teeth small, in broad bands in both jaws, bands fall short of posterior end of rictus; outer premaxillary teeth very slightly enlarged. Inner gill rakers of first arch 1 or 2 + 5 to 7 (7 to 9 total). First dorsal fin with 2 spines and 9 to 10 rays, serrations on second spine slender, closely spaced but not overlapping; pectoral fin rays i17 to i21; pelvic fin rays 10 or 11. Measurements in percentages of head length: snout length 27 to 34; orbit diameter 31 to 37; interorbital space 16 to 23; upper jaw length 26 to 32; orbit to angle of preopercle 32 to 40; barbel 8 to 20. Light organ not well developed externally; no scaleless fossa between pelvic fin bases. Pyloric caeca 21 to 32. Body scales somewhat deciduous, covered with conical spinules aligned in 10 to 12 (in adults) slightly convergent rows, the middle row larger than lateral ones; scales below second dorsal fin origin usually 6.5 to 9. **Colour:** brownish black overall, with hint of violet; abdominal region bluish black; mouth dusky; gill cavity black except for pale areas ventrally and along medial wall; fins uniformly black to brownish black.

Geographical Distribution : Gulf of California south to Chile (34°53.5'S), including Cocos I. and Galapagos (Fig. 628).

Habitat and Biology : Benthopelagic in 600 to 1865 m depth.

Size : To at least 30 cm total length.

Interest to Fisheries : This is one of the most common species of ***Nezumia*** in the eastern Pacific, and it ranges over an extensive latitudinal span. It is taken in moderate quantities by research vessels, but probably is too deep-living to occur with any frequency in commercial trawl catches.

Literature : Garman (1899); Iwamoto (1979).

Remarks : The chief distinguishing characteristic of ***N. convergens*** is the low inner gill raker count of the first arch: 9 or fewer total, 5 or 6, rarely 7, on lower limb. Its slender body (greatest depth usually less than 3/4 head length) and scale spinulation also help in differentiating the species from its closest relatives.

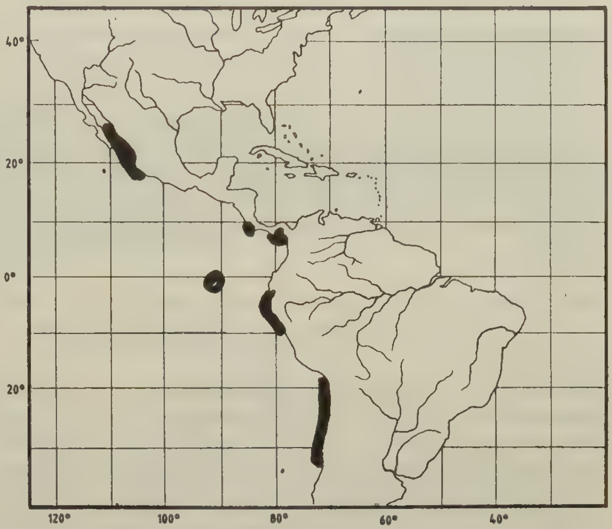


Fig. 628

Nezumia duodecim Iwamoto, 1970

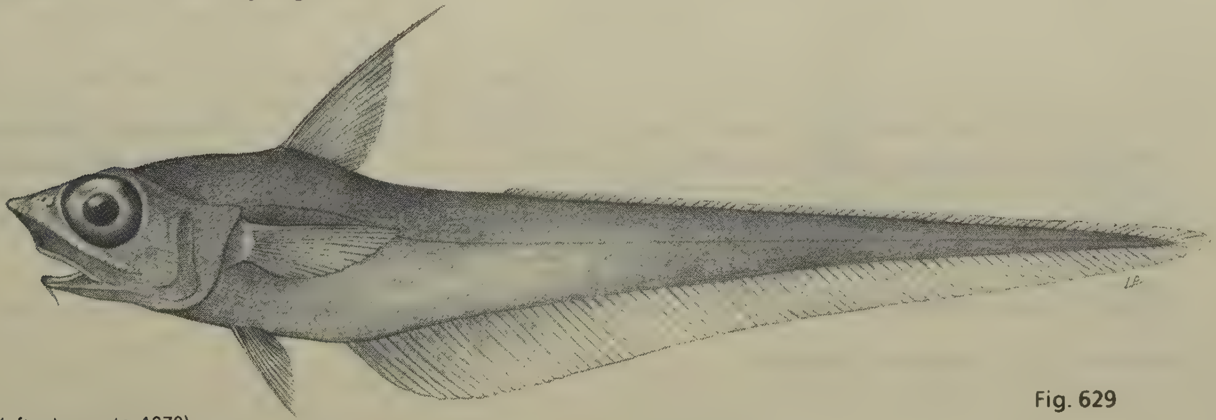
Fig. 629

MACROUR Nez 7

Scientific Name with Reference : ***Nezumia duodecim*** Iwamoto, 1970, Stud. Trop. Biol. Miami, (4)(pt. 2): 393, figs. 17b, 20b, 21b, 22-23)(Gulf of Guinea, 4°40'S, 11°00'E, off Congo, 951 m).

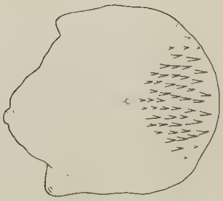
Synonyms : None

FAO Names : En - Twelve-rayed grenadier.

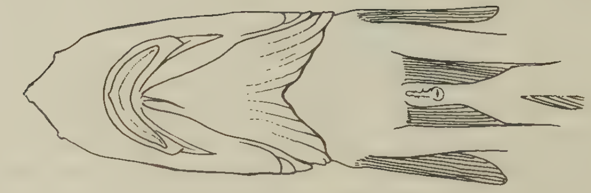


(after Iwamoto, 1970)

Fig. 629



scale



underside

Diagnostic Features : Ventral leading edge of snout and narrow ventromedian strip on underside naked, head otherwise completely scaled. Teeth in wide bands in both jaws; outer series of upper jaw slightly enlarged. Inner gill rakers of first arch 1 or 2 + 8 to 10 (10 to 12 total). First dorsal fin with 2 spines and 9 to 12 rays; pectoral fin rays i19 to i22; pelvic fin rays 11 to 13. Measurements in percentages of head length: snout length 30 to 33; preoral length 22 to 29; orbit diameter 32 to 38; interorbital space 18 to 23; upper jaw 32 to 36; barbel 8 to 16; orbit to angle of preopercle 35 to 43. Pyloric caeca 18 to 35. Scales highly deciduous, spinules small, short, conical, greatly appressed, generally absent along posterior margin, in 6 to 9 parallel rows with 1 to 4 spinules per row; scales below second dorsal fin 6 to 7. **Colour**: brownish to bluish overall; trunk bluish to blackish; fins blackish; mouth dusky; gill cavities blackish.

Geographical Distribution : Northwestern Africa, from 24°N, southerly into the Gulf of Guinea to Angola (Fig. 630).

Habitat and Biology : Benthopelagic in 329 to 1261 m, apparently found deeper in the northern part of its range. Merrett & Marshall (1981) found copepods (80%) and polychaetes (62%) in highest proportions in specimens they examined from the slope off northwestern Africa. Other crustaceans and a few fish formed the remainder of the diet. They stated that "***N. duodecim***, like the majority of macrourines, depends on a mixed diet of benthic and pelagic organisms."

Size : To more than 25 cm total length.

Interest to Fisheries : Relatively abundant in depths of 400 to 500 m, but size too small to be of commercial importance except for reduction to fish meal.

Literature : Iwamoto (1970); Merrett & Marshall (1981).

Remarks : ***Nezumia duodecim*** is distinguishable from most other members of the genus by its high pelvic-ray count, squamation, and proportional measurements.

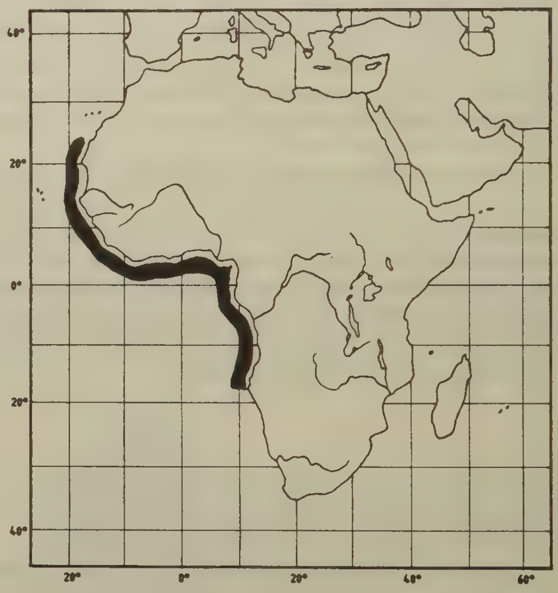


Fig. 630

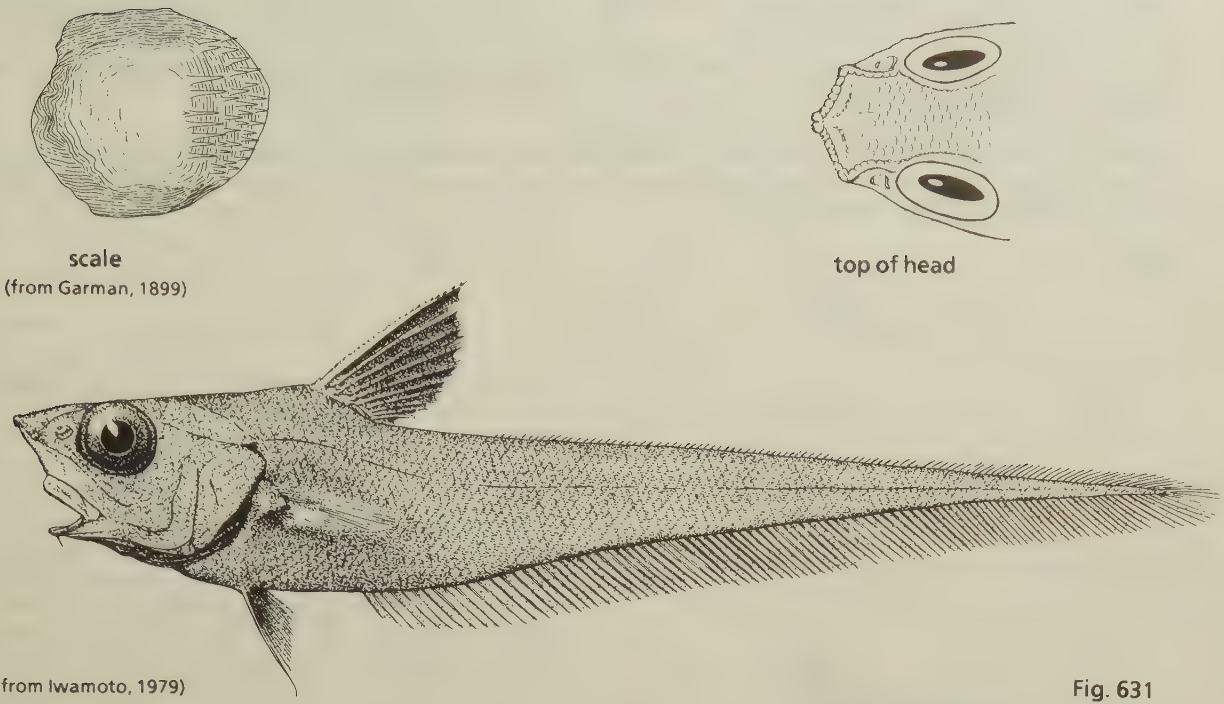
Nezumia latirostrata (Garman, 1899) Fig. 631

MACROUR Nez 8

Scientific Name with Reference : ***Macrurus latirostratus*** Garman, 1899, Mem. Mus. Comp. Zool. Harvard 24: 211, pl. 48, fig. 2 (Gulf of Panama; 589 to 935 m; ALBATROSS sta. 3354, 3384, 3394].

Synonyms : ***Lionurus (Nezumia) latirostratus*** -- Gilbert & Hubbs, 1916; ***Nezumia latirostrata*** -- Makushok, 1967

FAO Names : En - Broadsnout grenadier.


scale
(from Garman, 1899)

top of head

(from Iwamoto, 1979)

Fig. 631

Diagnostic Features : Snout short, conical; terminal snout scute small but stout, distinctly bifid; underside of snout and part of suborbital space naked; mandibular rami with loose scales along midline of each ramus; cephalic pores of lateralis system indistinct, although small dark papillae prominent on head. Teeth small, in moderately broad bands in both jaws, bands fall short of posterior end of rictus; outer premaxillary teeth slightly enlarged. Inner gill rakers of first arch 1 to 3 + 7 to 9 (9 to 11 total). First dorsal fin with 2 spines and 9 or 10 rays; serrations on second spine numerous, closely overlapping; pectoral fin rays i17 to i22; pelvic fin rays 9 or 10. Measurements in percentages of head length: snout length 27 to 34; orbit diameter 30 to 36; interorbital space 17 to 25; upper jaw 27 to 32; orbit to angle of preopercle 33 to 39; barbel 5 to 20. Pyloric caeca 17 to 25. Body scales fairly large and deciduous, densely covered with lanceolate spinules that are indistinctly aligned in convergent rows; scales below second dorsal fin origin 6 to 7.5. **Colour:** swarthy to brownish, abdominal region bluish black; mouth dusky, gill cavity black except for pale areas ventrally and along medial wall; fins dark brown to brownish black.

Geographical Distribution : Panama to northern Peru (Fig. 632).

Habitat and Biology : Benthopelagic in 605 to 1400 m depth. Almost ripe eggs were found in specimens taken off Ecuador in mid-September.

Size : To at least 23 cm total length.

Interest to Fisheries : This common species of the tropical eastern Pacific is occasionally taken in moderate quantities by trawlers, but no catch statistics are maintained for the species and it is probably not utilized.

Literature : Garman (1899); Iwamoto (1979).

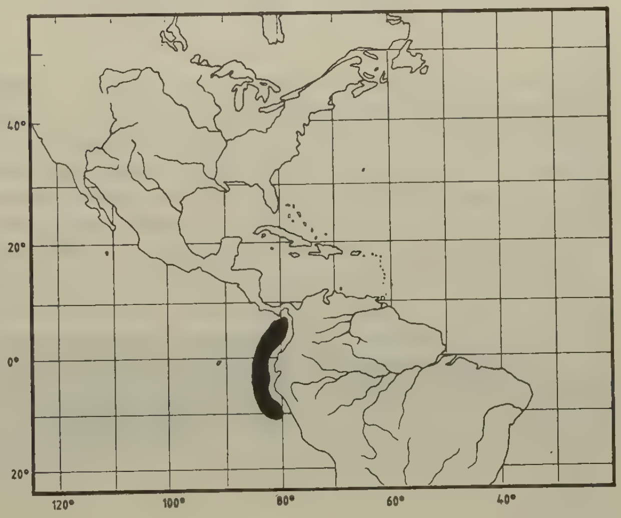


Fig. 632

Nezumia liolepis (Gilbert, 1890)

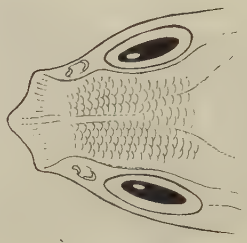
Fig. 633

MACROUR Nez 9

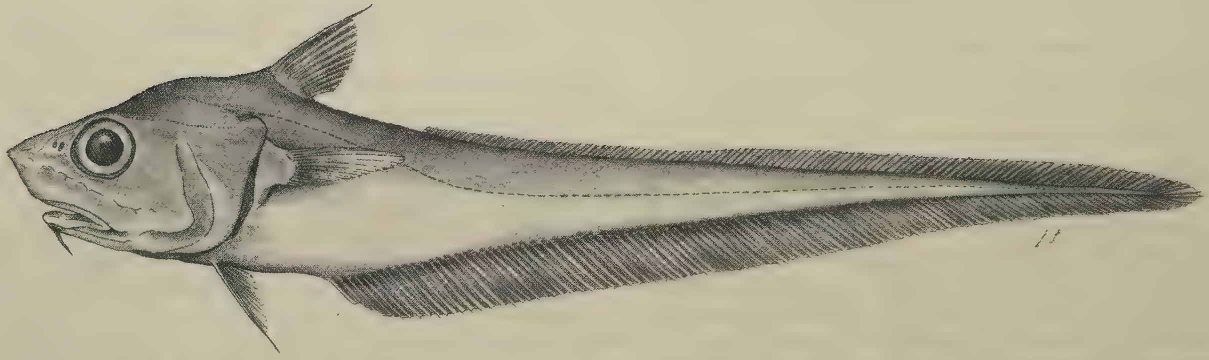
Scientific Name with Reference : ***Macrurus (Lionurus) liolepis*** Gilbert, 1890, Proc. U.S. Natl. Mus. 13: 117 (east of Santa Cruz I., California, USA; 33°49'45"N, 119°24'30"W; 1103 m; ALBATROSS sta. 2980).

Synonyms : ***Lionurus liolepis*** -- Goode & Bean, 1896; ***Macrurus barbiger*** Garman, 1899; ***Lionurus (Lionurus) liolepis*** -- Gilbert & Hubbs, 1916; ***Lionurus (Lionurus) barbiger*** -- Gilbert & Hubbs, 1916; ***Nezumia liolepis*** -- Fitch & Lavenberg, 1968; ***Ventrifossa barbiger*** -- Marshall, 1973.

FAO Names : En - Smooth grenadier.



top of head



(after Iwamoto, 1979)

Fig. 633

Diagnostic Features : Snout narrow, bluntly rounded, barely protruding beyond rather large mouth; terminal snout scute small, inconspicuous; suborbital ridge rounded and shallow in cross section, without scutelike scales; snout and suborbital region almost entirely naked, but sometimes a narrow wedge of small scales extends forward from preopercle region onto lower portion of suborbital; mandibular rami with a narrow row of small loose scales posteriorly along midline of each ramus, but otherwise naked; ventral margin of preopercle broadly naked. Cephalic pores of lateralis system indistinct, but sensory papillae densely dispersed over head. Teeth minute, in narrow bands in premaxillary, outer series slightly enlarged; mandibular teeth in a moderate band; teeth extend posteriorly almost to end of rictus. Inner gill rakers on first arch 1 to 3 + 7 to 10 (9 to 12 total). First dorsal fin with 2 spines and 8 to 11 rays, serrations on second spine few or absent; pectoral fin rays i19 to i24; pelvic rays 10 or 11 (rarely 12). Measurements in percentages of head length: snout length 24 to 28; orbits 25 to 31; interorbital 21 to 27; upper jaw 31 to 40; orbit to angle of preopercle 36 to 44; barbel 10 to 20. Pyloric caeca 25 to 37. Body scales small, highly deciduous, mostly without spinules, but some with a few small, greatly reclined conical spinules; scales below origin of second dorsal fin 7 to 10. **Colour:** greyish brown tinged with violet overall; abdominal region, gill membranes, and gill cover blackish; oral and gill cavities and fins dusky to blackish.

Geographical Distribution : Central California (36°49'N to southern Mexico (17°24'N) and Gulf of California (Fig. 634).

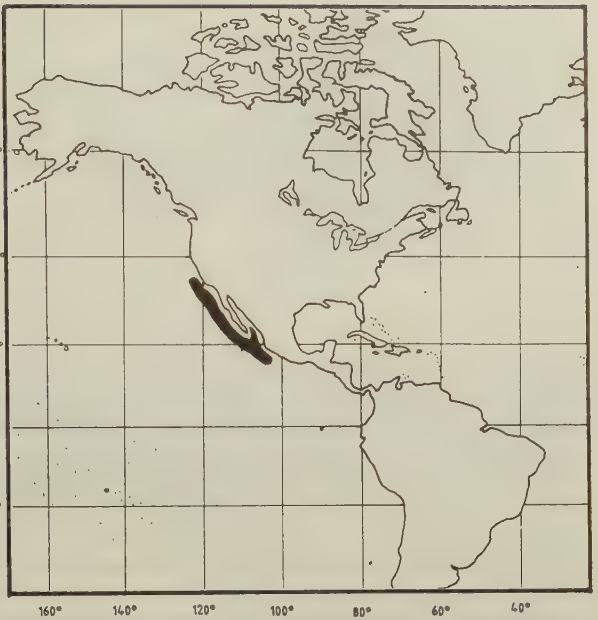


Fig. 634

Habitat and Biology : Benthopelagic in 768 to 1655 m depth.

Size : To about 30 cm total length.

Interest to Fisheries : This species is occasionally taken by trawlers fishing for Dover sole in deep waters off central California, but is otherwise of no commercial value.

Local Names : USA: Smooth grenadier.

Literature : Gilbert (1890); Garman (1899); Iwamoto & Stein (1974); Iwamoto (1979); Merrett et al. (1983).

Remarks : ***Nezumia liolepis*** is provisionally included in ***Nezumia***, although doing so stretches the definition of the genus. General features of the fish suggest a relationship with ***N. stelgidolepis*** and ***N. pulchella***. The highly reduced squamation, extensive naked areas on the head, reduced or obsolescent serrations on the spinous dorsal fin ray, and small periproct that lacks an associated anterior fossa are presumably reductive characters -- ones that are more strongly developed in other members ***Nezumia***. These and other features, however, suggest relationship with other genera such as ***Asthenomacrurus, Pseudonezumia***, ***Parakumba***, and ***Macrosmia***, as well as ***Nezumia japonica*** (Matsubara, 1943) and ***N. tinro*** Sazonov, 1985. In discussing the affinities of ***Macrosmia***, Merrett et al. (1983:551) stated that "based on external morphological characters, relationships among macrourid genera are obscure. Indeed, the relative importance of characters used is apparently unequal in different generic groups." It is apparent to the present author that much research must be done before we have a firm understanding of generic relationships within macrouroids. ***Nezumia liolepis*** is one of those problematic species that has yet to find a proper "home."

Nezumia loricata (Garman, 1899)

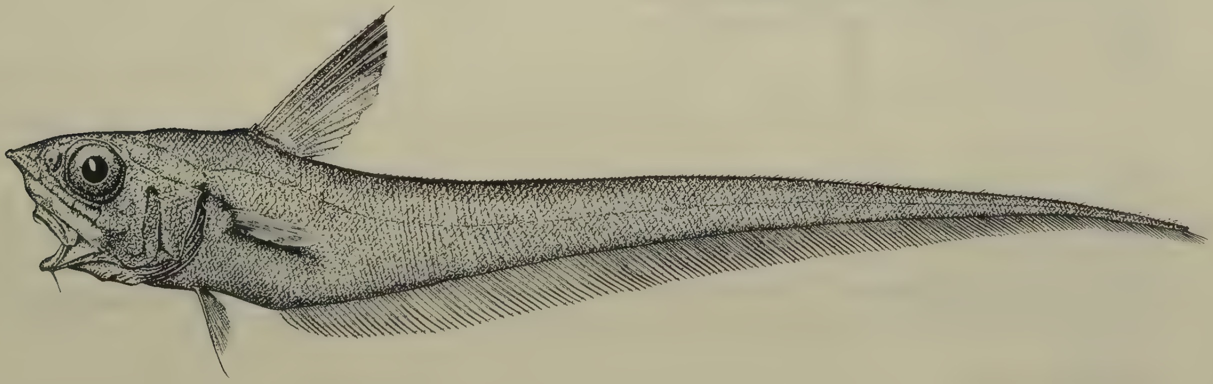
Fig. 635

MACROUR Nez 10

Scientific Name with Reference : ***Macrurus loricata*** Garman, 1899, Mem. Mus. Comp. Zool. Harvard, 24: 208-209, pl. 47, figs 2, 2b (Galapagos; 598 to 605 m; ALBATROSS sta. 3409, 3410).

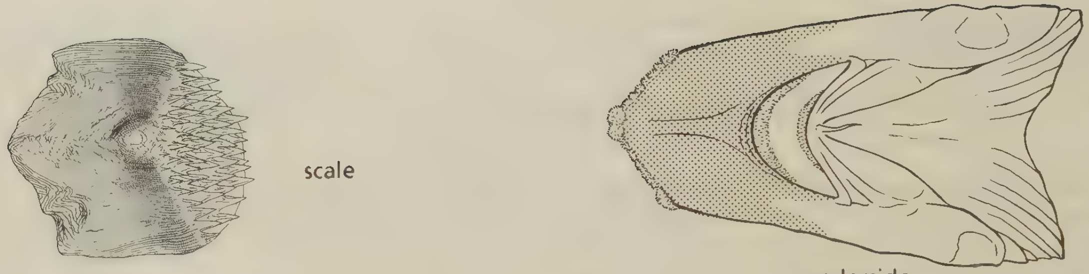
Synonyms : ***Lionurus (Nezumia) loricatus*** -- Gilbert & Hubbs, 1916; ***Nezumia loricata*** -- Makushok, 1967.

FAO Names : **En** - Parrot grenadier.



(from Iwamoto, 1979)

Fig. 635


scale

underside

(after Iwamoto, 1979)

Fig. 635

Diagnostic Features : Head about 17 to 20 percent of total length, with a strongly developed, angular suborbital ridge; snout moderately pointed, with spiny tubercular scales at the tip and lateral angles; scales absent on underside of snout and along part of suborbital region, but mandibles covered with small deciduous scales; upper jaws extend to slightly behind vertical through midorbit; orbits about 1/3 of head length; interorbital narrow, its width going 1.3 to 1.7 into orbit diameter. Teeth small, in moderate bands in both jaws, outer series of upper jaws slightly enlarged. Inner gill rakers on first arch 9 to 14 total. First dorsal fin with 2 spines and 9 to 12 segmented rays, the second spine serrated, its height 80 to 100% of head length; pectoral fin rays 20 to 25; pelvic fin rays 10 to 12, the outermost slightly prolonged, extending to 3rd or 4th anal ray. Measurements in percentages of head length: preoral length 25 to 30; upper jaw 29 to 33; outer gill slit 14 to 17; barbel length 10 to 17. Pyloric caeca 20 to 32. Body scales adherent, covered with dagger-shaped to narrowly triangular spinules arranged in somewhat convergent rows; 6.5 to 7.5 rows below midbase of first dorsal, 7.5 to 9 below origin of second dorsal. Anus closer to origin of pelvic fins than to that of anal fin. **Colour:** swarthy to medium brown, darker ventrally; fins blackish; mouth dusky.

Geographical Distribution : Galapagos Islands, off central Chile, and temperate Australia (Victoria and Western Australia) (Fig. 636).

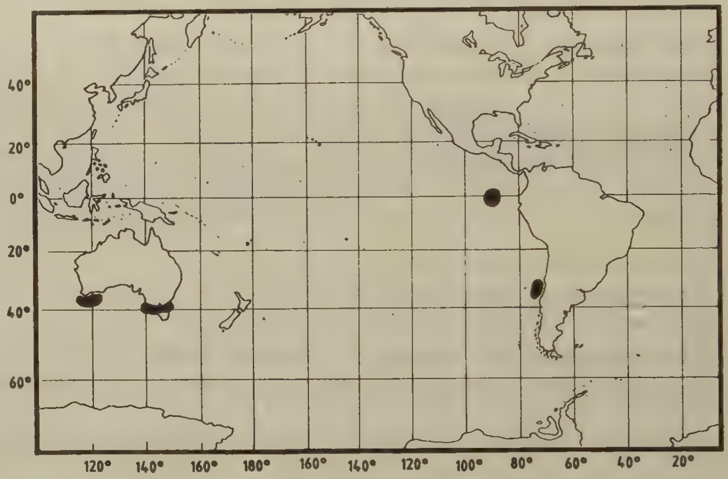


Fig. 636

Habitat and Biology : Benthopelagic in about 600 to 800 m depth in the Galapagos population, and to almost 1500 in the Chilean population.

Size : To about 30 cm total length.

Interest to Fisheries : Taken as bycatch in trawl fisheries.

Literature : Garman (1899); Iwamoto (1979); Paxton et al. (1989).

Remarks : Two subspecies are recognized, ***N. loricata loricata*** from the Galapagos and ***N. loricata atomos*** from Chile. The species was recently listed from Australian waters (Paxton et al. 1989), but no subspecific designation was given. The Chilean and Australian records suggest a broad temperate distribution across the South Pacific.

Nezumia micronychodon Iwamoto, 1970

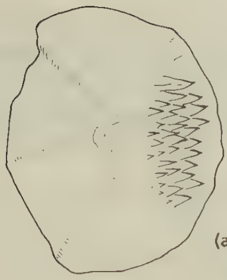
Fig. 637

MACROUR Nez 11

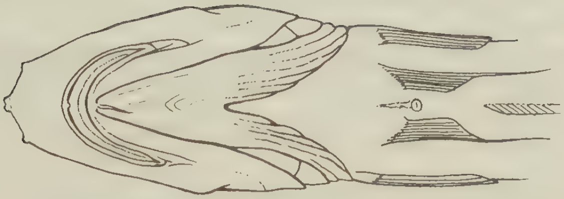
Scientific Name with Reference : ***Nezumia micronychodon*** Iwamoto, 1970, Stud. Trop. Oceanogr. Miami, (4)(pt. 2): 385, figs. 17a, 18-19, 20a, 21a, 22-23. (Gulf of Guinea, off Congo, 3°34'S, 9°58'E, 823 m).

Synonyms : None.

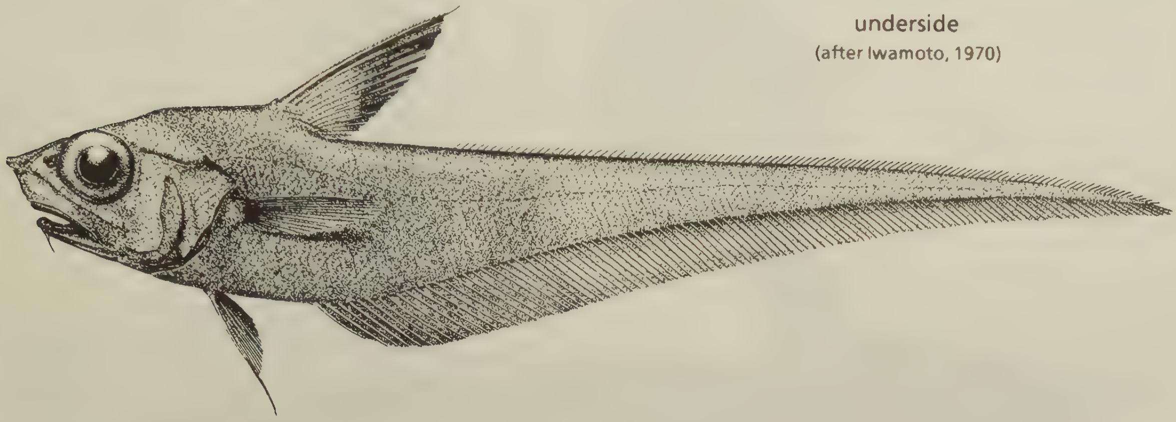
FAO Names : En - Smalltooth grenadier.



scale
(after Iwamoto, 1970)



underside
(after Iwamoto, 1970)



(from Iwamoto, in Smith & Heemstra, 1986)

Fig. 637

Diagnostic Features : Snout short, narrow, bluntly acute, tipped with a small bifid scute; underside naked, head otherwise completely scaled; gill membranes not broadly connected over isthmus; gill openings extend forward to below hind margin of orbits. Teeth small, conical, recurved, in wide bands; no enlarged premaxillary series. Inner gill rakers on first arch 1 or 2 + 11 to 15 (13 to 17 total). First dorsal fin with 2 spines and 10 or 11 rays; pectoral fin rays i19 to i24 (usually i20 to i22); pelvic fin rays 8 to 10. Measurements in percentages of head length: snout length 27 to 32; preoral length 17 to 20; orbit diameter 30 to 35; upper jaw 33 to 36; barbel 7 to 10. Pyloric caeca about 20. Scale spinules broad, shield-shaped (more slender in juveniles); scales below origin of second dorsal fin 6. **Colour:** brownish to swarthy; trunk bluish to violet; fins blackish; mouth and gill cavities grey to blackish.

Geographical Distribution : West Africa, from Western Sahara (about 24°N) south to Angola (Fig. 638).

Habitat and Biology : Benthopelagic in 366 to 1620 m depth, but in greatest abundance around 500 to 600 m. Investigation by Merrett & Marshall (1981) showed that specimens from northwestern Africa feed primarily on infaunal organisms, especially polychaetes (90% of contents) and a variety of small crustaceans. Smaller individuals (30 to 40 mm head length) feed mostly on epibenthic organisms, especially the copepod ***Aetidopsis carinata.***

Size : To 34 cm total length.

Interest to Fisheries : Fairly abundant in the Gulf of Guinea, but not currently utilized, as far as known.

Literature : Iwamoto (1970).

Remarks : ***Nezumia micronychodon*** is readily distinguished from all other members of the genus by its high gill-raker count and the relatively unrestricted gill openings.

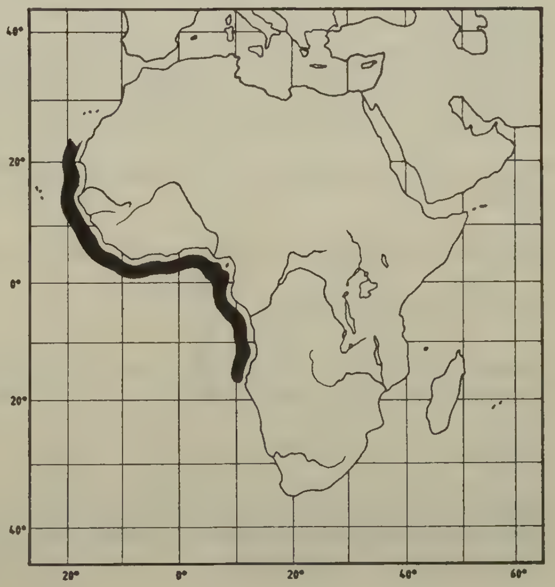


Fig. 638

Nezumia milleri Iwamoto, 1973

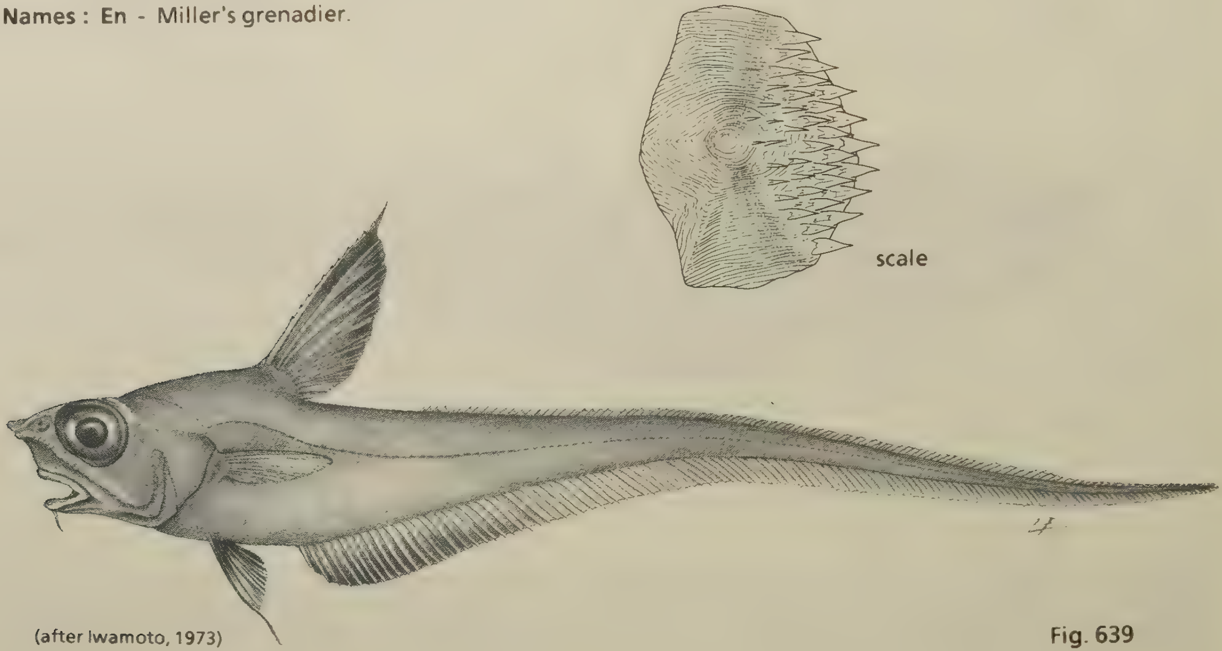
Fig. 639

MACROUR Nez 12

Scientific Name with Reference : ***Nezumia milleri*** Iwamoto, 1973, Proc. Biol. Soc. Wash., 86 (31):373, figs. 1-4 (Angola, 17°23'S, 11°20'E, 366-412 m).

Synonyms : None

FAO Names : En - Miller's grenadier.



(after Iwamoto, 1973)

Fig. 639

Diagnostic Features : Snout short, acute, ventral surfaces in front of premaxillary symphysis naked, otherwise head surfaces completely scale-covered. Teeth small, in moderately wide bands. Inner gill rakers of first arch 2 + 8 or 9. First dorsal fin with 2 spines and 9 or 10 rays; pectoral fin rays i17 to i20; pelvic fin rays 8. Measurements in percentages of head length: snout length 25.5 to 27; orbit diameter 40 to 42; interorbital space 16 to 23; upper jaw length 29 to 33; orbit to angle of preopercle 30.5 to 35; barbel 11 to 14. Scale spinules moderately slender, lanceolate; scales below second dorsal fin 6 or 7; lateral-line scales over a distance equal to preodorsal length 31 to 37. **Colour**: greyish brown to swarthy; trunk dark, violet tinged, fading on tail to medium brown; fins pale to blackish; first dorsal fin black on distal half; mouth blackish, gill cavity mostly black.

Geographical Distribution : Off Angola and probably Namibia (Fig. 640).

Habitat and Biology : Benthopelagic in 366 to 450 m depth.

Size : To 18 cm total length.

Interest to Fisheries : Species probably too small to be of interest to commercial fisheries.

Literature : Iwamoto (1973).

Remarks : Closely related to ***N. aequalis*** (Günther) but distinguishable from that species in having the combination of shorter snout and larger orbit.

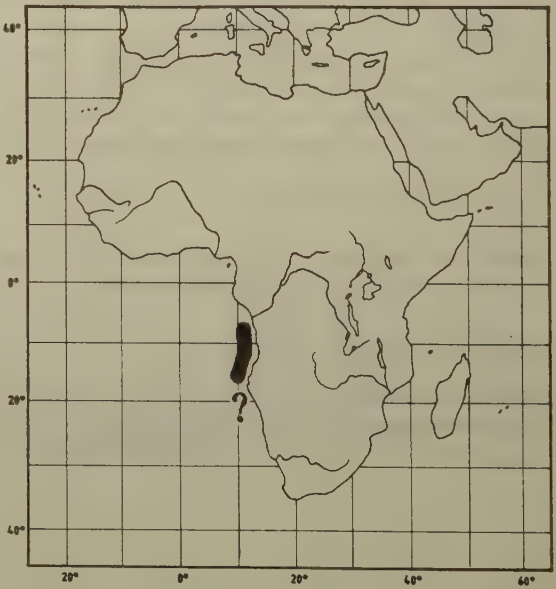


Fig. 640

Nezumia orbitalis (Garman, 1899)

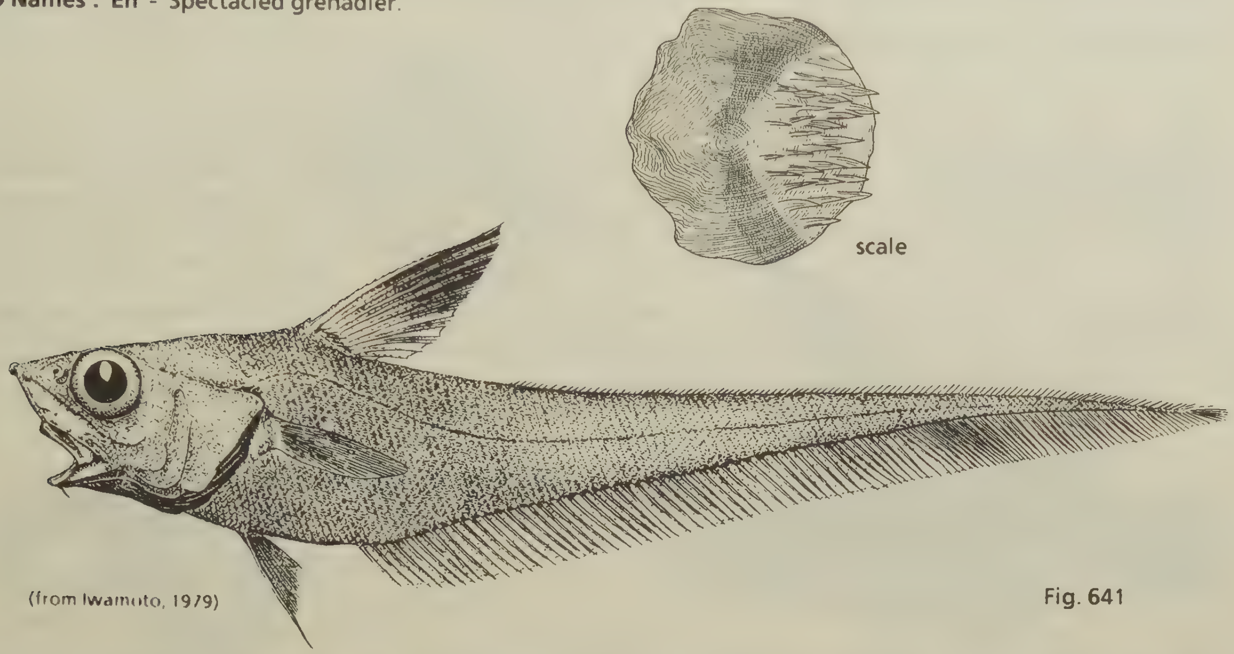
Fig. 641

MACROUR Nez 13

Scientific Name with Reference : ***Macrurus orbitalis*** Garman, 1899, Mem. Mus. Comp. Zool. Harvard, 24: 207, pl. 47, fig. 1, 1b (Gulf of Panama, 7°32'36"N, 79°16'W, 523 m; ALBATROSS sta. 3385).

Synonyms : ***Lionurus (Nezumia) orbitalis*** -- Gilbert & Hubbs, 1916; ***Nezumia orbitalis*** -- Makushok, 1967.

FAO Names : En - Spectacled grenadier.



(from Iwamoto, 1979)

Fig. 641

Diagnostic Features : Snout short, conical, terminal snout scute small but stout; underside of snout and suborbital region mostly naked; mandibular rami with loose scales along midline of each ramus; cephalic pores of lateralis system indistinct. Teeth small, in moderately wide bands in both jaws, bands fall short of posterior end of rictus; outer premaxillary teeth slightly enlarged. Inner gill rakers on first arch 1 or 2 + 8 to 10 (10 to 11 total). First dorsal fin with 2 spines and 9 or 10 rays, serrations on second spine numerous, closely overlapping; pectoral fin rays i19 to i21; pelvic fin rays 9. Measurements in percentages of head length: snout length 25 to 30; orbit 29 to 34; interorbital space 17 to 19; upper jaw 27 to 32; orbit to angle of preopercle 33 to 40; barbel 6 to 12. Pyloric caeca 17 to 23. Body scales fairly large, densely covered with conical to narrowly lanceolate spinules aligned in as many as 15 convergent rows; scales below midbase of first dorsal fin 4.5 to 5.5, below second dorsal origin 6.5 to 7. **Colour:** reddish brown, abdominal region bluish black, head paler grey; orbit ringed with black; oral and gill cavities blackish; fins light, first dorsal fin black distally.

Geographical Distribution : Gulf of Panama to northern Peru (Fig. 642).

Habitat and Biology : Benthopelagic in 523 to 800 m depth.

Size : To about 20 cm total length.

Interest to Fisheries : This small species is occasionally taken in the bycatch of trawlers off Panama and Peru, but no catch statistics are maintained for the species and it is presumably not utilized.

Literature : Garman (1899); Iwamoto (1979).

Remarks : ***Nezumia orbitalis*** is likely to be confused only with ***N. latirostrata***, with which it shares a similar range and depth distribution, but it can be distinguished from that species by the dorsal fin being distinctly black-blotched distally (vs. blackish overall), the prominent black-rimmed orbits (vs. lacking black rim), and its generally paler colour.

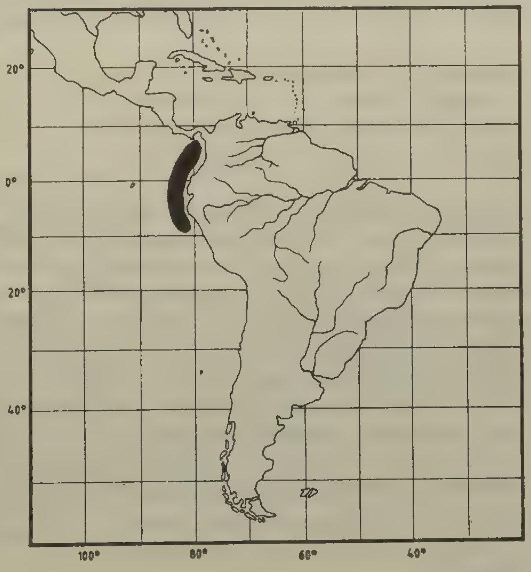


Fig. 642

Nezumia propinqua (Gilbert & Cramer, 1897)

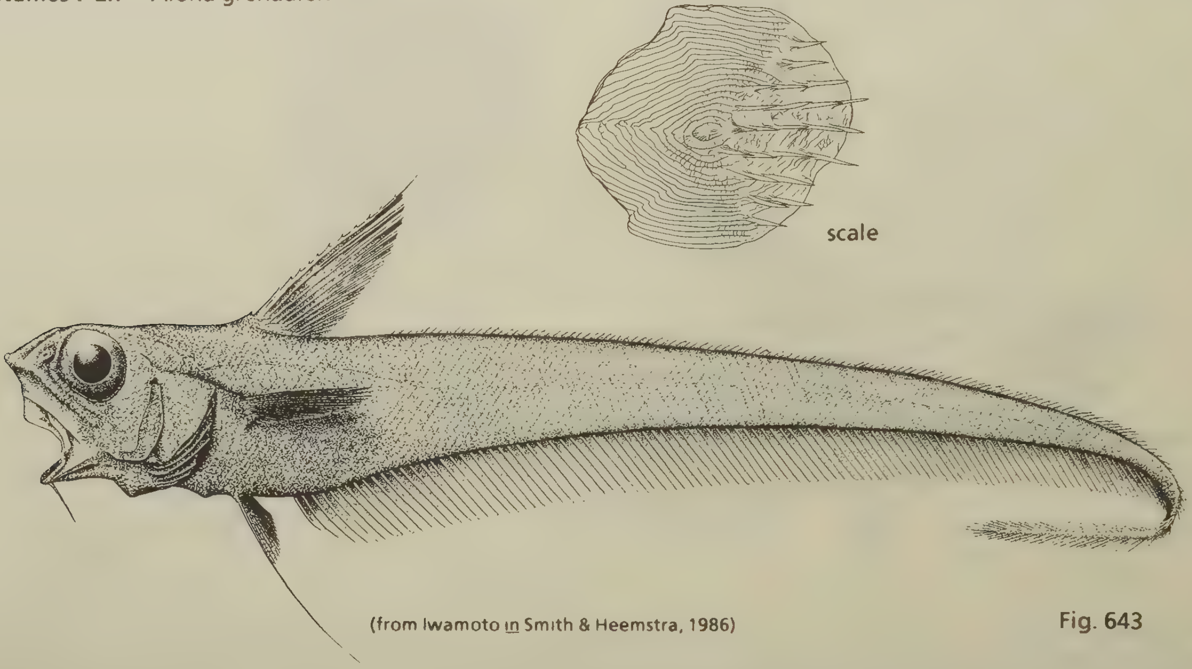
Fig. 643

MACROUR Nez 14

Scientific Name with Reference : ***Macrourus propinquus*** Gilbert & Cramer, 1897: Proc. U.S. Natl. Mus. 19: 424, pl. 42, fig. 2 (Kaiwi Channel, Hawaiian Islands, 351 fms [642 m]).

Synonyms : ***Lionurus propinquus*** -- Gilbert & Hubbs, 1916; ***Nezumia propinquus*** -- Marshall & Iwamoto in Marshall, 1973.

FAO Names : En - Aloha grenadier.



(from Iwamoto in Smith & Heemstra, 1986)

Fig. 643

Diagnostic Features : Snout rather blunt; terminal and lateral snout scutes large, blunt; undersides of snout, mandible, most of suborbital, and part of lower margin of preopercle naked. Teeth in moderately wide bands, outer series in upper jaw slightly enlarged. Inner gill rakers on first arch usually 2 + 7 or 8 (9 or 10 total), outer gill rakers on second arch 1 or 2 + 7 or 8. First dorsal fin with 2 spines and 11 or 12 rays, serrations on second spine slender, rather widely spaced; pectoral fin rays i18 to i23; pelvic fin rays 13 to 17. Measurements in percentages of head length: snout length 28 to 32; orbit diameter 31 to 37; interorbital space 22 to 28; upper jaw 31 to 36; orbit to angle of preopercle 28 to 35; barbel 14 to 22. Pyloric caeca 22 to 32. Spinules on body scales sharp, needlelike, in parallel rows; scales below second dorsal fin 9 to 12; lateral-line scales over distance equal to predorsal length 33 to 34. **Colour:** brownish overall, violaceous over abdomen; gill membranes blackish; fins dusky, first dorsal blackish distally.

Geographical Distribution : Hawaiian Is., southern Africa off Mozambique, Kyushu-Palau Ridge, and Sala y Gomez Ridge (southeastern Pacific) (Fig. 644).

Habitat and Biology : Benthopelagic in 523 to 870 m depth. Off Hawaii Gilbert (1905) reported individuals taken in June by the ALBATROSS had been feeding exclusively on small eggs; mature eggs were found in a specimen taken in August.

Size : To about 27 cm total length.

Interest to Fisheries : Occasionally taken in trawls fished in deep waters off Hawaii, but of no commercial interest.

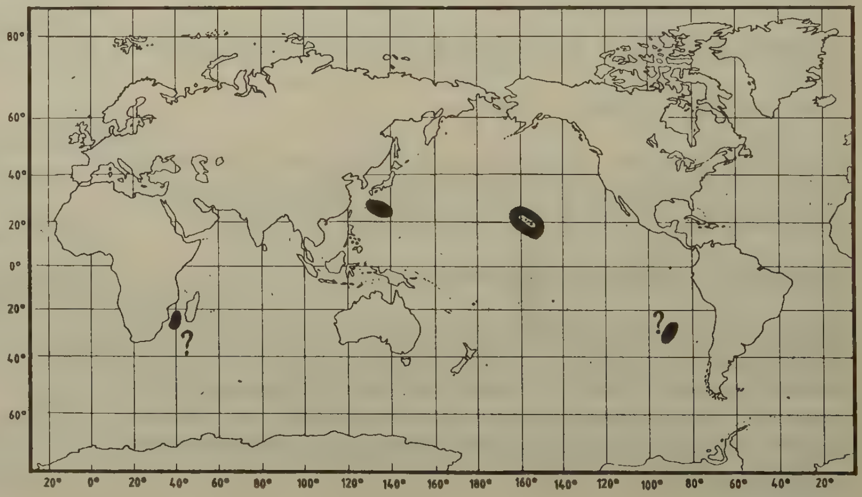


Fig. 644

Local Names : USA: Kaiwi Channel grenadier.

Literature : Gilbert (1905); Iwamoto (in Smith & Heemstra, 1986).

Remarks : This species is close to ***N. condylura*** from Japan. Differences between the two appear to lie in the steeper dorsal profile of the nape in ***N. propinqua***; its slightly higher pelvic fin ray count; somewhat longer pectoral and pelvic fins (60 to 67% head length and 79 to 107% head length, respectively, compared with about 55 to 61% and 68 to 81%); and anus closer to pelvic fin bases (distance anus to anal fin 25 to 32% of head length, compared with 15 to 20% in ***N. condylura***).

Nezumia proxima (Smith & Radcliffe, 1912)

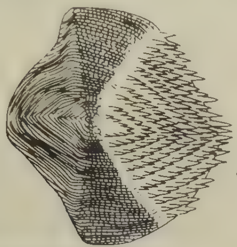
Fig. 645

MACROUR Nez 15

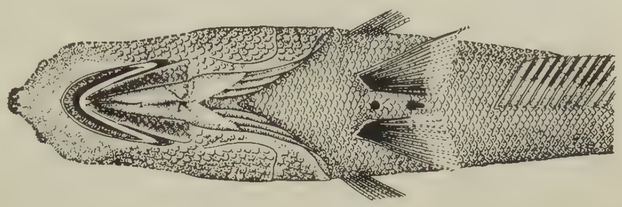
Scientific Name with Reference : ***Macrourus proxima*** Smith & Radcliffe, 1912, Proc. U.S. Natl. Mus. 43: 119, pl. 26, fig. 2 (Sogod Bay, Leyte, Philippines; 502 fms [918 m]; ALBATROSS sta. 5202).

Synonyms : ***Macrourus nasutus*** (non ***Coryphaenoides nasutus*** Günther); ***Lionurus proximus*** -- Gilbert & Hubbs, 1920; ***Lionurus abei*** Matsubara, 1943; ***Nezumia proximus*** -- Okamura, 1970a.

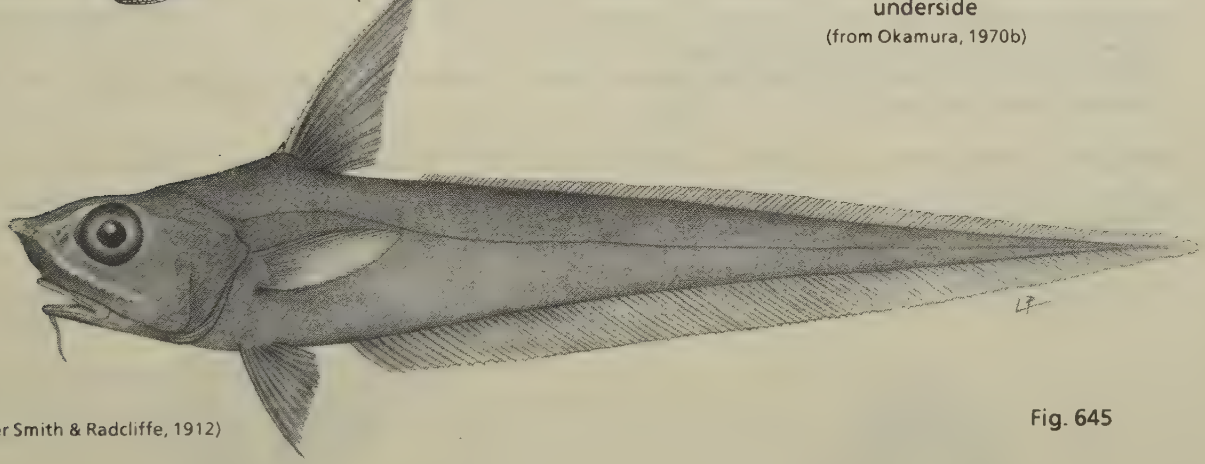
FAO Names : **En** - Short-tail grenadier.



scale
(from Okamura, 1970b)



underside
(from Okamura, 1970b)



(after Smith & Radcliffe, 1912)

Fig. 645

Diagnostic Features : Snout short, conical; terminal and lateral snout scutes broad, spiny; underside of snout and part of infraorbital region naked; mandibular rami with small deciduous scales posteriorly; pores large and prominent on head. Teeth in broadly tapered bands in both jaws, outer series of premaxillary slightly enlarged. Inner gill raker on first arch usually 2 + 7 or 8. First dorsal fin with 2 spines and 9 to 11 rays, serrations on second spine widely spaced, non-overlapping, varying from 6 in 133 mm specimens to 18 in 249 mm specimens; pectoral fin rays i17 to i19; pelvic fin rays 9 (rarely 8 or 10). Measurements in percentages of head length: snout length 23 to 31; orbit diameter 28 to 33 (35); interorbital space 15 to 25; upper jaw 31 to 34; orbit to angle of preopercle 27 to 39; barbel 15 to 23. Pyloric caeca 24 to 31. Scales small, those on body covered with long slender spinules aligned in 4 to 26 discrete parallel rows (number of spinule rows size dependent; fewest in smallest specimens); spinules range from conical to hastate; scales below midbase of first dorsal 6 or 7; below second dorsal origin 7 to 9. **Colour**: overall dark brown, abdominal region blackish; mouth cavity greyish, gill cavity whitish with blackish margins; pelvic fins blackish, other fins dusky.

Geographical Distribution : Recorded from southern Japan, East China Sea, and Philippines; distribution probably continuous between these points (Fig. 646).

Habitat and Biology : Benthopelagic in 355 to 910 m depth; temperature preferences about 4 to 8°C.

Size : To about 37 cm total length.

Interest to Fisheries : Apparently a fairly common species in southern Japan and the East China Sea, but no catch statistics are maintained as far as known.

Local Names : JAPAN: Higo-sokodara

Literature : Radcliffe (1912); Gilbert & Hubbs (1916); Okamura (1970a); Okamura, Amaoka & Mitani (1982).

Remarks : ***Nezumia spinosa*** (Gilbert & Hubbs, 1916) has been synonymized with this species by Okamura (1970a), but the two species are quite different, ***N. spinosa*** having a much higher first dorsal fin (about 130 to 160% of head length), the spine and proximal portions of segmented rays black; underside of head completely naked; scale spinulation long, conical, needlelike; pelvic fin rays 8; barbel slightly shorter (12 to 15% head length); suborbital slightly narrower (12 to 13% of head length vs. 13.5 to 16%); and various other less-notable differences.

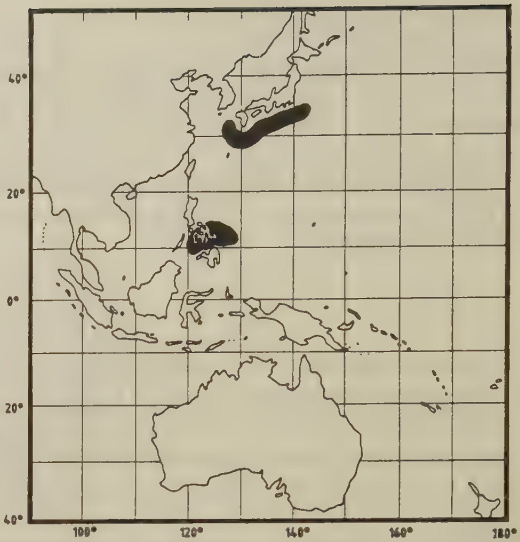


Fig. 646

Nezumia pudens Gilbert & Thompson, 1916

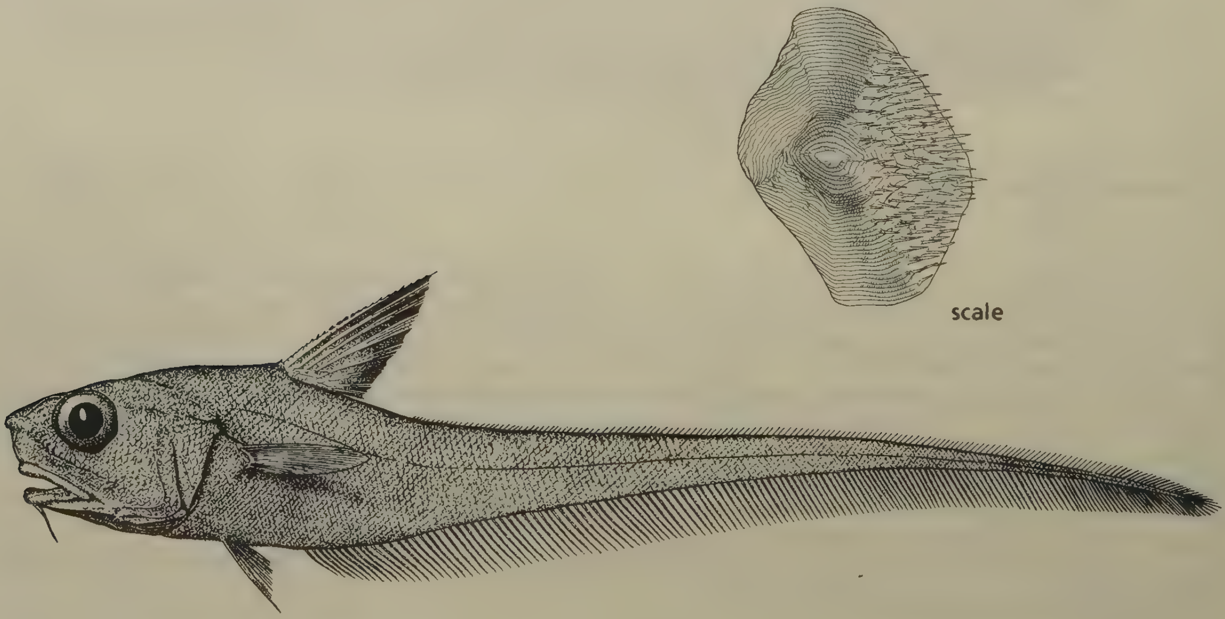
Fig. 647

MACROUR Nez 16

Scientific Name with Reference : ***Nezumia pudens*** Gilbert & Thompson, 1916, Proc. U.S. Natl. Mus. 50: 472-473, pl. 5, fig. 2 (off Lota, Chile; 38°08'S, 75°53'W; 1 240 m).

Synonyms : ***Lionurus (Nezumia) pulchella*** -- Gilbert & Hubbs, 1916; ***Macruroplus pudens*** -- Fowler, 1944.

FAO Names : En - Atacama grenadier.


scale

(from Iwamoto, 1979)

Fig. 647

Diagnostic Features : Head relatively compressed laterally, surfaces smoothly rounded, suborbital ridge low; snout short, blunt and narrow, terminal and lateral angles not especially set off from adjacent scales; scales cover most of head except for a ventromedian strip on the snout and ventral margin of suborbital region; orbits longer than interorbital width, upper jaws extend posteriorly to below hind edge of pupil. Teeth small, in broad tapered bands, outer series of upper jaw enlarged. Inner gill rakers on first arch 9 to 10 total. First dorsal fin with 2 spines and 9 to 11 rays; spinous second ray armed with slender, sharp spikes, fairly widely spaced along leading edge, its height 80 to 95% of head length; pectoral fin rays 19 to 24; pelvic fin rays 10 or 11, the outermost filamentous and extending beyond anal fin origin. Measurements in percentages of head length: snout length 18 to 22; orbits 31 to 35; interorbital width 22 to 23; upper jaw 30 to 39; outer gill slit 14 to 18; barbel length 20 to 25. Anus in the middle third of space between pelvic fin bases and origin of anal fin. Pyloric caeca numerous, about 35 to 45. Body scales densely covered with slender, sharp spinules arranged in quincunx pattern or in close, strongly convergent rows; scales below midbase of first dorsal 7.5 to 8.5; scale rows below origin of second dorsal 8.5 to 10. **Colour:** medium brown, blackish ventrally; fins, gill membranes, and linings of mouth and gullet also blackish; first dorsal fin slightly paler near base.

Geographical Distribution : Central Chile (between 32°S and 38°S) (Fig. 648).

Habitat and Biology : Benthopelagic in 580 to 1 238 m depth.

Size : To at least 40 cm total length.

Interest to Fisheries : Taken incidentally by trawlers fishing in deep waters off Chile, but no catch statistics are maintained.

Literature : Gilbert & Thompson (1916); Iwamoto (1979).

Remarks : In the eastern Pacific, ***Nezumia pudens*** is likely to be confused only with ***N. stelgidolepis, N. pulchella***, and ***N. liolepis***, but can be distinguished from those species by its more fully scaled head, smaller mucous pores on suborbital and mandibles, shorter gill filaments (less than diameter of eye lens), and more posteriorly placed first dorsal fin.

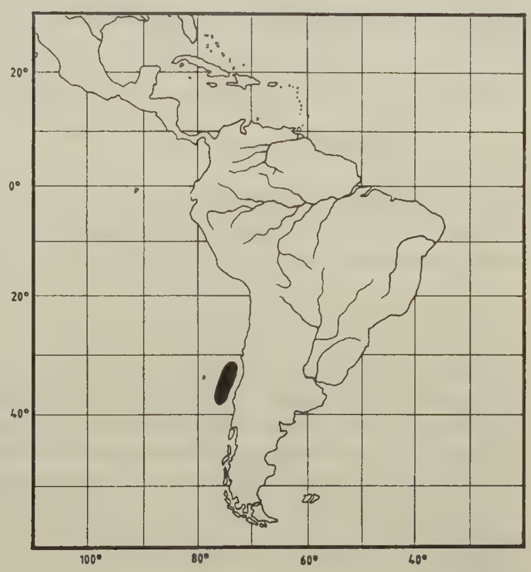


Fig. 648

Nezumia pulchella (Pequeño, 1971)

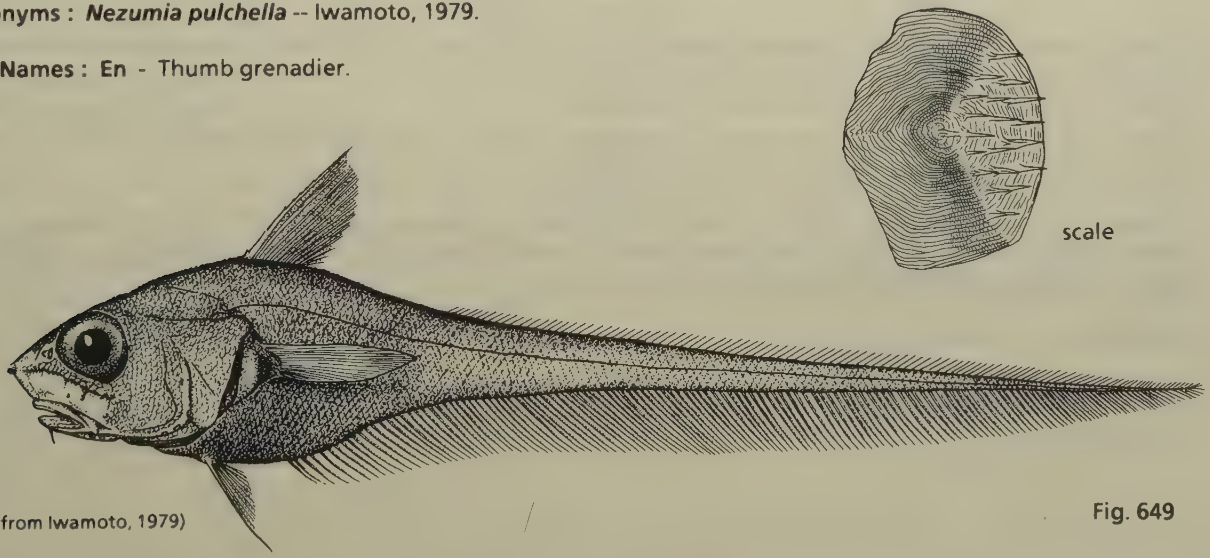
Fig. 649

MACROUR Nez 17

Scientific Name with Reference : ***Macruroplus pulchellus*** Pequeño, 1971, Bol. Mus. Nac. Hist. Nat. Santiago, 32: 293, fig. 17 (off Chile; 25°26'S, 70°37'W; 374-424 m].

Synonyms : ***Nezumia pulchella*** -- Iwamoto, 1979.

FAO Names : En - Thumb grenadier.



(from Iwamoto, 1979)

Fig. 649

Diagnostic Features : Snout rather narrow, bluntly pointed, protruding slightly beyond the rather large mouth; suborbital ridge well developed, low and not markedly raised; terminal snout scute well developed; underside and upper leading margin of snout, underside of suborbital, mandible, lower edge of preopercle, and gill membranes naked; pores of lateralis system prominent on head. Teeth small, in moderate bands in upper jaws, outer series slightly enlarged; in broad tapered bands in lower jaw; teeth extend posteriorly almost to end of rictus. Inner gill rakers on first arch 1 to 3 + 7 to 9 (9 to 11 total), on second arch 8 to 10 total. First dorsal fin with 2 spines and 10 or 11 rays, serrations on second spine numerous, closely set; pectoral fin rays i18 to i27; pelvic fin rays 11 or 12. Measurements in percentages of head length: snout length 21 to 26; orbit diameter 30 to 34; interorbital width 20 to 25; upper jaw 30 to 34; orbit to angle of preopercle 34 to 38; barbel 9 to 16. Pyloric caeca 23 to 31. Body scales densely covered with small conical spinules arranged in parallel to slightly convergent rows; scales below midbase of first dorsal 4.5 to 6, below origin of second dorsal fin 5.5 to 7.5. **Colour:** swarthy to medium brown overall, blackish ventrally, bluish tinge over abdomen; oral and gill cavities generally pale but blackish around margin of latter; fins dusky to blackish, first dorsal fin blacker distally.

Geographical Distribution : Northern Peru (7°49'S) to central Chile (33°S) (Fig. 650).

Habitat and Biology : Benthopelagic in 250 to 960 m depth.

Size : To at least 30 cm total length.

Interest to Fisheries : This species is taken incidentally by trawlers fishing in deep waters off Chile and Peru, but no catch statistics are maintained for it.

Literature : Pequeño (1971); Iwamoto (1979).

Remarks : ***Nezumia pulchella*** is closely related to ***N. stelgidolepis***, the two overlapping in their distributions in Peru. The pelvic fin ray count (9 or 10 in ***N. stelgidolepis***), scale spinules (conical to lanceolate, in somewhat quincunx order in ***N. stelgidolepis***), and absence of scales on branchiostegal membranes distinguish the two. ***Nezumia pudens*** from Chile is distinguishable by its fully scaled underside of head and shorter barbel (9 to 16% of head length).

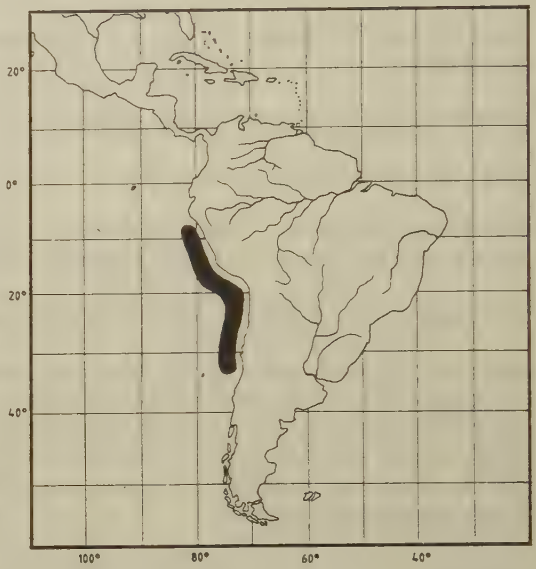


Fig. 650

Nezumia sclerorhynchus (Valenciennes, 1838)

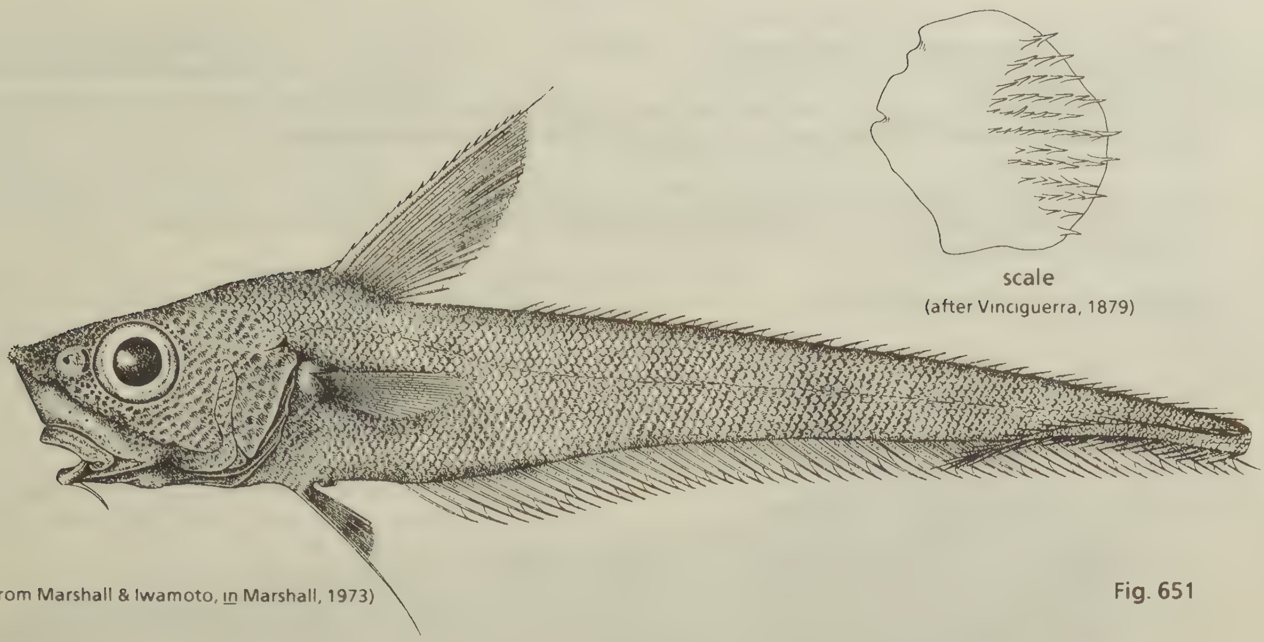
Fig. 651

MACROUR Nez 18

Scientific Name with Reference : ***Macrourus sclerorhynchus*** Valenciennes, in Webb & Berthelot, Hist. Nat. des iles Canaries, Zool., pt. 1, Ichthyol., 1838: 80, pl. 14, fig. 1 (Canary Is.).

Synonyms : ***Coryphaenoides serratus*** -- Thomson, 1878; ***Macrurus violaceus*** Zugmayer, 1911; ***Lionurus (Nezumia) sclerorhynchus*** -- Gilbert & Hubbs, 1916; ***Macruroplus sclerorhynchus*** -- Fowler, 1936; ***Macruroplus violaceus*** -- Fowler, 1936; ***Nezumia sclerorhynchus*** -- Grey, 1956.

FAO Names : En - Roughtip grenadier.



scale
(after Vinciguerra, 1879)

(from Marshall & Iwamoto, in Marshall, 1973)

Fig. 651

Diagnostic Features : Snout short, bluntly acute; terminal snout scute broad, blunt; ventral surface of snout naked posteriorly onto most of suborbital, mandible mostly naked, pores prominent on head. Teeth small, in wide bands. Inner gill rakers on first arch usually 1 or 2 + 7 to 9 (9 to 11 total). First dorsal with 2 spines and 9 to 11 rays, serrations on second spine slender, rather widely spaced, 21 or fewer; pectoral fin rays i16 to i20; pelvic fin rays 9 (rarely 7, 8, or 10). Measurements in percentages of head length: snout length 27 to 34; orbit diameter 31 to 41; interorbital space 22 to 29; upper jaw length 24 to 32; orbit to angle of preopercle 31 to 38; barbel 11 to 22. Pyloric caeca 22 to 25. Spinules on body scales slender, conical, reclined, arranged in converging rows, median row somewhat enlarged in some scales; scales below second dorsal origin 9; lateral-line scales over distance equal to preodorsal length 34 to 40. **Colour:** in alcohol brownish overall, paler on head, violet tinged over abdomen, some silvery reflections; fins pale to blackish; first dorsal fin uniformly blackish; mouth and gill cavity mostly black.

Geographical Distribution : North Atlantic to the north of the Gulf of Guinea in the east, into the Mediterranean Sea, and north of Straits of Florida in the west (Fig. 652).

Habitat and Biology : Benthopelagic in 130 to 1 097 m depth, with the species most numerous in depths of 450 to 730 m (Marshall & Iwamoto, 1973) in the open Atlantic and in 500 to 800 m in the Mediterranean (Rannou, 1976). Feeds on small crustaceans (copepods, amphipods, decapods, mysids, etc.) and polychaetes. Sexual maturity is attained at 30 to 40 mm in head length, which corresponds to an age of 11 to 20 years (Merrett & Marshall, 1981)

Size : To about 27 cm total length.

Interest to Fisheries : Taken as bycatch in trawls.

Literature : Vinciguerra (1879); Vaillant (1888); Collett (1896); Zugmayer (1911); Koefoed (1927); Marshall & Iwamoto in Marshall (1973); Rannou (1976); Merrett & Marshall (1981). (See Grey, 1956, and Marshall, 1973, for extensive references.)

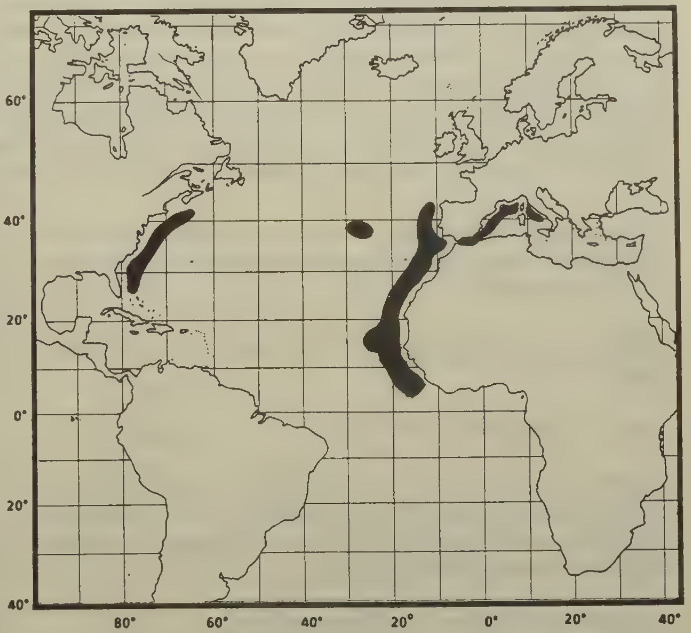


Fig. 652

Remarks : Sometimes confused with ***Nezumia aequalis*** (Günther) but easily distinguished from that species in having the ventral aspects of snout, suborbital, and mandible mostly naked; conical rather than shield-shaped spinules; and enlarged head pores.

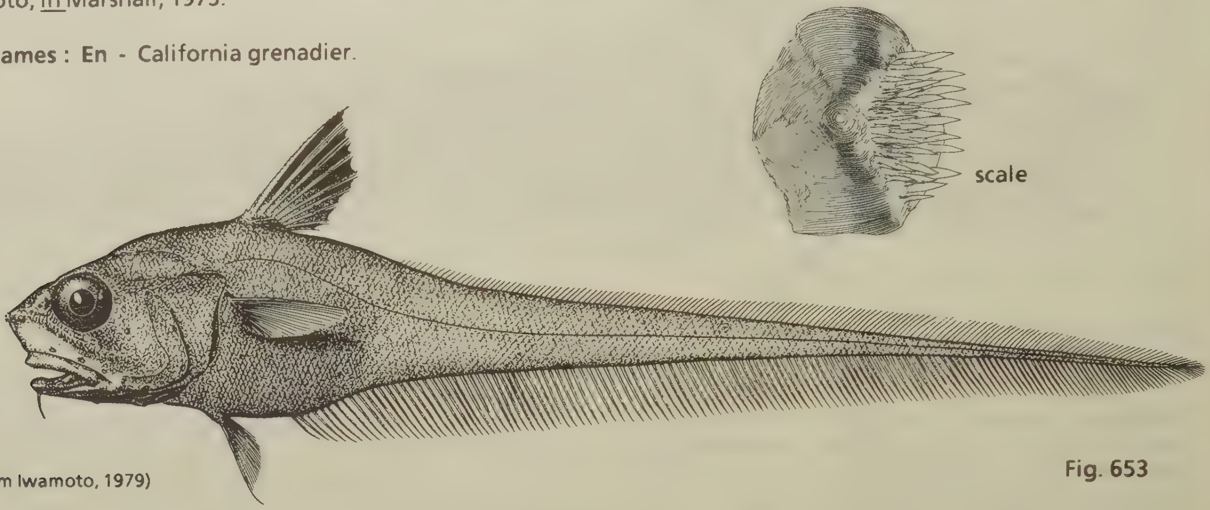
Nezumia stegidolepis (Gilbert, 1890)

Fig. 653

Scientific Name with Reference : ***Macrurus (Macrurus) stelgidolepis*** Gilbert, 1890, Proc. U.S. Natl. Mus., 13: 116 (off Pt. Conception, California, USA; 34°10'45"N, 120°16'45"W; 488 m; ALBATROSS sta. 2960).

Synonyms : ***Macrurus gracillicauda*** Garman, 1899; ***Lionurus (Nezumia) stelgidolepis*** -- Gilbert & Hubbs, 1916; ***Lionurus stelgidolepis*** -- Barnhart, 1936; ***Nezumia stelgidolepis*** -- Roedel, 1951; ***Nezumia gracillicauda*** -- Marshall & Iwamoto, in Marshall, 1973.

FAO Names : **En** - California grenadier.



(from Iwamoto, 1979)

Fig. 653

Diagnostic Features : Snout narrow, bluntly pointed, protruding slightly beyond rather large mouth; terminal snout scute developed but not conspicuously; suborbital ridge low, not markedly raised; underside of snout, most of suborbital region, and anterior half of mandible naked; lowermost branchiostegal rays scaled; pores of lateralis system prominent on head. Teeth small, in broad tapered bands in both jaws; outer premaxillary series slightly enlarged; teeth extend posteriorly almost to end of rictus. Inner gill rakers on first arch 10 or 11 total, on second arch 9 to 11. First dorsal fin with 2 spines and 9 or 10 segmented rays, serrations on second spine numerous, closely spaced; pectoral fin rays i19 to i25; pelvic fin rays 9 or 10. Measurements in percentages of head length: snout length 22 to 28; orbit diameter 26 to 32; interorbital space 20 to 26; upper jaw length 31 to 37; orbit to angle of preopercle 35 to 45; barbel length 15 to 26. Pyloric caeca 24 to 58. Body scales densely covered with conical to narrowly lanceolate spinules arranged in short, slightly convergent rows; scales below second dorsal origin 7 or 8. **Colour:** swarthy overall, but blackish ventrally, bluish tinge over abdominal region; oral and gill cavities generally pale with some blackish areas; fins dusky to blackish, first dorsal fin slightly paler basally.

Geographical Distribution : A wide-ranging species known from British Columbia off Vancouver Island to southern Peru (18°10'S) (Fig. 654).

Habitat and Biology : Benthopelagic in 277 to 909 m depth.

Size : To about 45 cm total length.

Interest to Fisheries : This common species is taken incidentally by trawlers fishing for Dover sole in deep waters off northern and central California, and perhaps elsewhere, but is not landed so far as known.

Local Names : USA: California grenadier.

Literature : Gilbert (1890); Garman (1899); Iwamoto & Stein (1974); Iwamoto (1979).

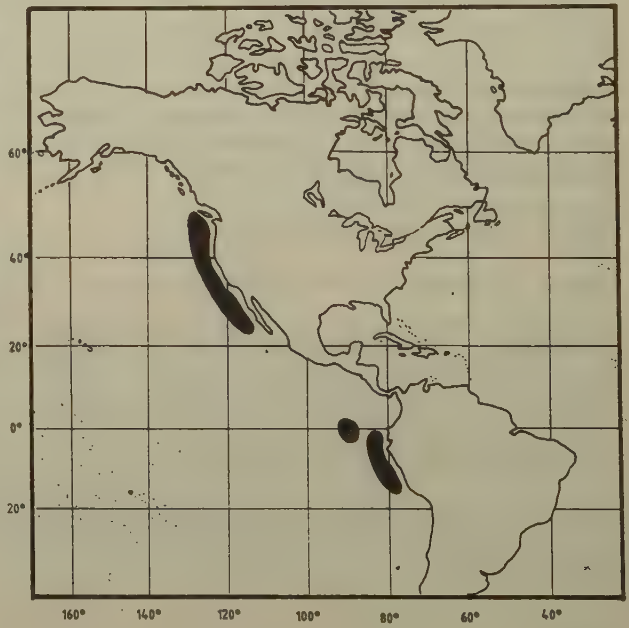


Fig. 654

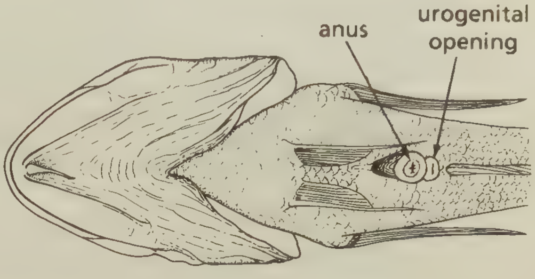
Sphagemacrurus Fowler, 1925

MACROUR Spha

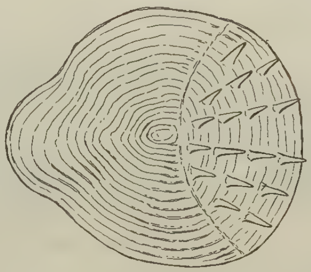
Genus with Reference : ***Sphagemacrurus*** Fowler, 1925, Am.Mus. Novit. 162:3 (type species ***Macrurus hirundo*** Collett, 1896, by original designation).

Synonyms : ***Grenurus*** Parr, 1946 (type species ***Grenurus grenadae*** Parr, 1946, by original designation).

Diagnostic Features: Macrourines with 7 branchiostegal rays. Body compressed and deep; snout blunt, high, tipped with a strong terminal scute, naked ventrally. A short barbel present. Jaw teeth small, in narrow bands. First dorsal fin base elevated; pelvic fin origin below gill cover, well forward of pectoral fin bases; anal fin origin below or anterior to base of first dorsal fin. Anus and urogenital openings in middle of a broad periproct spanning about 2/3 of the area between pelvic and anal fins (Fig. 655). Precaudal vertebrae 11 or 12. Swimbladder with 2 retia mirabilia. Body scales with short, sharp spinules arranged in parallel to slightly divergent rows (Fig. 656); reticulate structure developed.



underside Fig. 655



scale Fig. 656
(after Gilbert & Hubbs, 1920)

Habitat, Distribution and Biology: Benthopelagic in about 500 to 2 300 m. Apparently worldwide in tropical waters, except absent in eastern Pacific.

Size: To about 25 cm total length.

Interest to Fisheries: In the Gulf of Mexico, ***S. grenadae*** is taken occasionally as part of the bycatch of deepwater trawlers. Off Hawaii, ***S. gibber*** was occasionally taken in moderate numbers during exploratory deepwater trawling in the 1960's. The species are too small and never found in sufficient quantity to be of commercial interest except as bycatch.

Literature: Fowler (1925); Parr (1946); Marshall (1973).

Remarks: Characters used to construct the key to species were taken from the literature and from limited study specimens. The key should be used with that thought in mind.

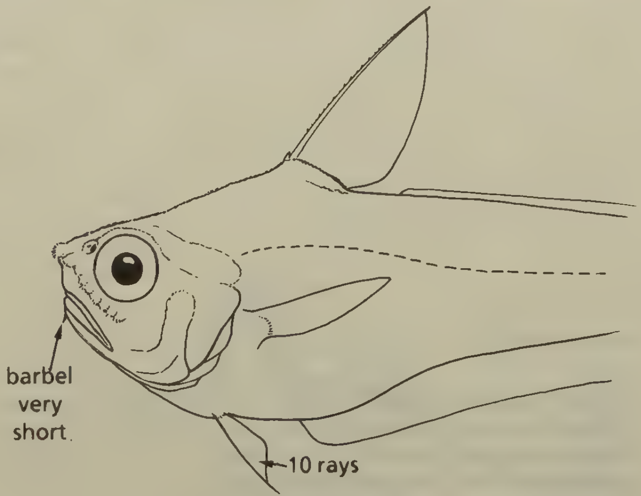
Key to Species of *Sphagemacrurus*

1a. Inner gill rakers on first arch 14 or 15 total; length of upper jaw 40 to 41% of head length; interorbital space 30 to 32% of head length; pelvic fin rays 12 or 13 ...... ***S. gibber*** (Hawaiian Islands)

1b. Inner gill rakers on first arch 11 or fewer; length of upper jaw less than 40% of head length; interorbital space less than 30% of head length; pelvic fin rays 8 to 14

- **2a.** Barbel much less than 1/2 orbit; inner gill rakers on lower limb of first arch 7; pelvic fin rays 10 .... ***S. decimalis*** (Philippines, Fig. 657)

- **2b.** Barbel about equal to or more than 1/2 orbit diameter; inner gill rakers on lower limb of first arch 7 or more; pelvic fin rays 8 to 14



S. decimalis Fig. 657
(after Gilbert & Hubbs; 1920)

3a. Orbit about 1.2 times or more into distance orbit to angle of preopercle; pelvic fin rays 8 to 10; barbel about 1/2 or less of greatest orbit diameter .... ***S. richardi***
(Indonesia, Fig. 658)

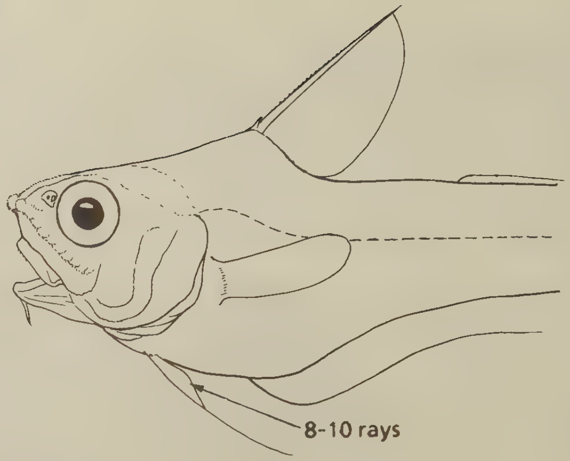
3b. Orbit less than 1.2 times into distance orbit to angle of preopercle; pelvic fin rays 10 to 14; barbel about 1/2 or more of greatest orbit diameter

- 4a. Orbit diameter 31 to 36% of head length, shorter or longer than snout; barbel 16 to 31% of head length; pelvic fin rays 11 to 14 .... ***S. pumiliceps***
  (Indian O., Philippines, Indonesia)

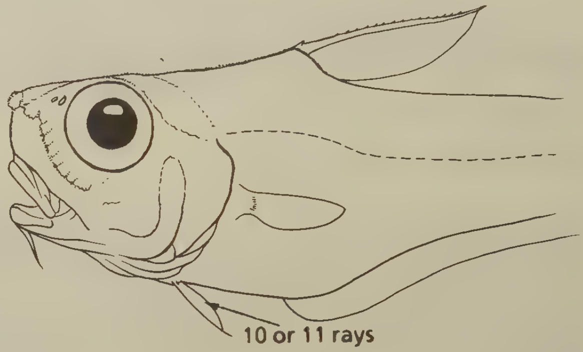
- 4b. Orbit diameter 33 to 40% of head length, longer than snout; barbel 18.5 to 26% of head length; pelvic fin rays 10 to 12

  - 5a. Interorbital space 26 to 30 of head length; upper jaw 37 to 39% of head length; pelvic fin rays 10 or 11 .... ***S. hirundo***
    (NE Atlantic, Fig. 659)

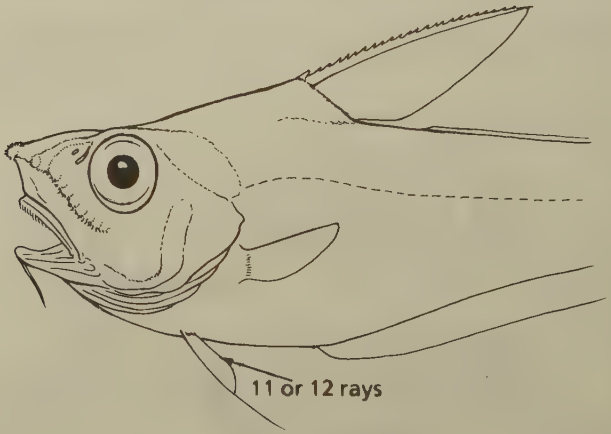
  - 5b. Interorbital space 22 to 27% of head length; upper jaw 34 to 37% of head length; pelvic fin rays 11 or 12 .... ***S. grenadae***
    (W Atlantic, Fig. 660)



S. richardi Fig. 658
(after Weber & de Beaufort, 1929)



S. hirundo Fig. 659
(after Nybelin, 1948)



S. grenadae Fig. 660
(after Marshall, 1973)

List of Species

Sphagemacrurus decimalis (Gilbert & Hubbs, 1920)
Sphagemacrurus gibber (Gilbert & Cramer, 1897)
Sphagemacrurus grenadae (Parr, 1946)
Sphagemacrurus hirundo (Collett, 1896)
Sphagemacrurus richardi (Weber, 1913)
Sphagemacrurus pumiliceps (Alcock, 1894)

Sphagemacrurus grenadae (Parr, 1946)

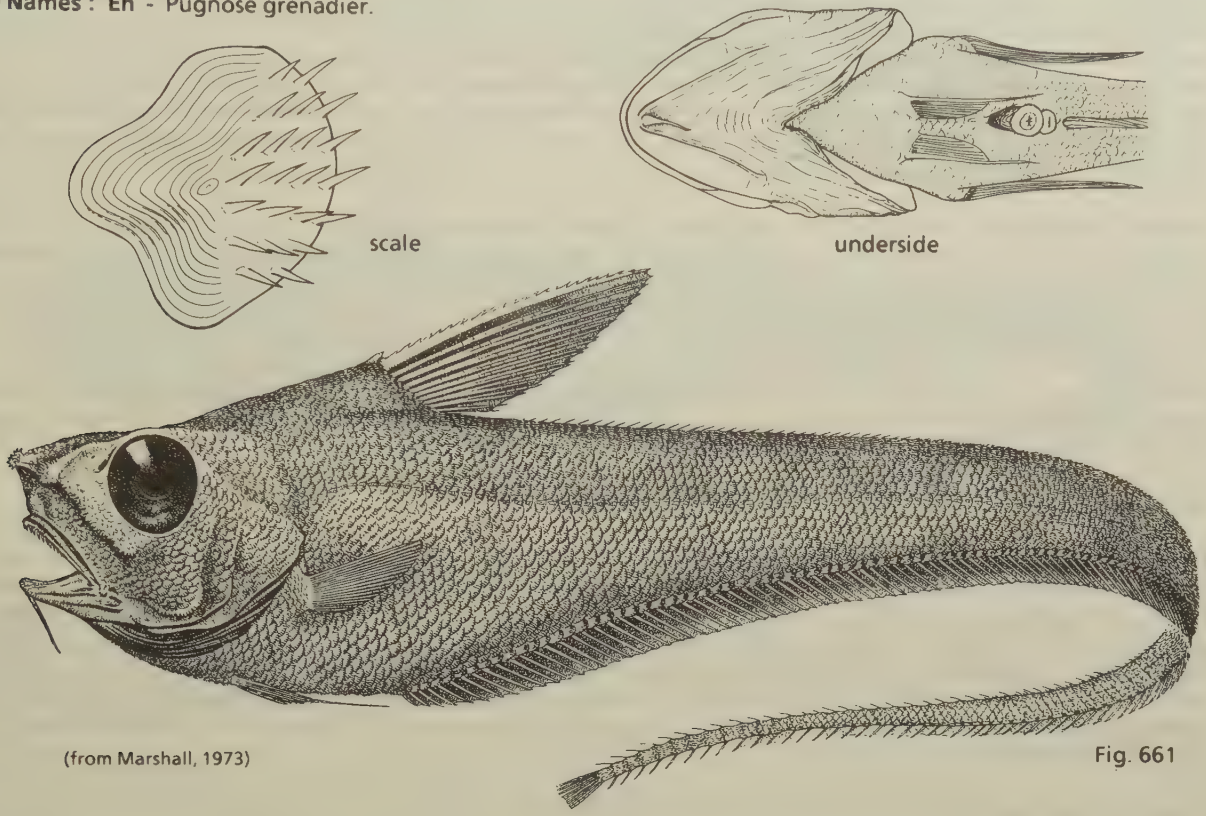
Fig. 661

MACROUR Spha 1

Scientific Name with Reference : ***Grenurus grenadae*** Parr, 1946, Bull. Bingham Oceanogr. Coll. 10 (1): 46 (off Grenada, West Indies: 12°03'55"N, 61°49'40"W; 576 fms,[1053 m]; BLAKE sta. 265).

Synonyms : ***Sphagemacrurus grenadae*** -- Marshall, 1973.

FAO Names : En - Pugnose grenadier.



(from Marshall, 1973)

Fig. 661

Diagnostic Features : Orbit longer than snout, about 0.9 to 1.1 times into distance orbit to angle of preopercle; barbel more than 1/2 orbit diameter. Inner gill rakers on first arch 9 or 10 total. Pelvic fin rays 11 or 12. Measurements in percentages of head length: orbit diameter 33 to 35; interorbital 22 to 27; upper jaws 34 to 37; barbel length 18.5 to 25.8. About 9 short, stumpy pyloric caeca.

Geographical Distribution : Gulf of Mexico and Caribbean Sea; one record from Hudson Canyon (ca. 39°N, 72°W) (Fig. 662).

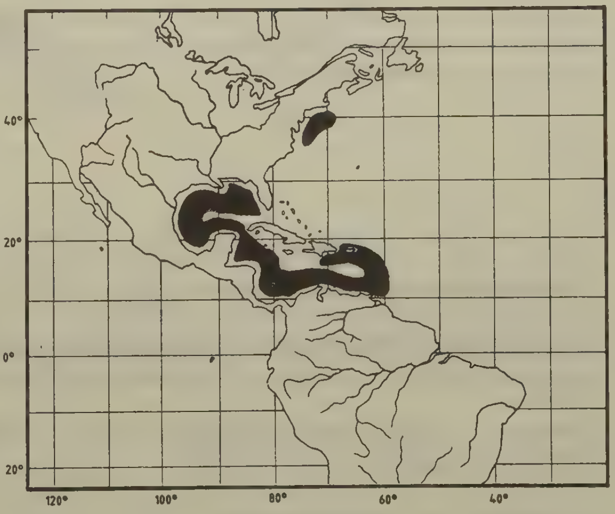


Fig. 662

Habitat and Biology : Benthopelagic in about 1 000 to more than 1 500 m depth.

Size : To about 25 cm total length.

Interest to Fisheries : Forms a part of the by-catch of deepwater trawls in the Gulf of Mexico, but is of no commercial significance.

Literature : Parr (1946); Marshall (1973).

Remarks : The species is closely related to ***S. hirundo*** from the eastern Atlantic and ***S. pumiliceps*** from the Indian Ocean. Characters used to distinguish the three are not supported by statistically significant numbers and should be viewed with caution. A more thorough study using adequate numbers of specimens is necessary.

Trachonurus Günther, 1887

MACROUR Tra

Genus with Reference : ***Trachonurus*** Günther, 1887, Rep. Sci. Results Voy. CHALLENGER, Zool., 22:142 (as subgenus of ***Macrurus***) (type species ***Coryphaenoides villosus*** Günther, 1877, by monotypy).

Synonyms : None.

Diagnostic Features: Macrourines with 7 branchiostegal rays. Head laterally compressed, snout bluntly rounded; interopercle broadly exposed ventrally and covered with scales; a short barbel present. Jaw teeth short, in narrow bands. Spinous dorsal ray flexible, with a smooth leading edge. Pelvic fins small, originating behind pectoral fin, with 6 or 7 rays. Anus and urogenital openings in middle of broad periproct spanning area between pelvic and anal fins. Squamation strongly adherent, bristly, scales with rather few upright spinules; usually a patch of scales on gular membrane and a few small scales on branchiostegal membranes. Precaudal vertebrae 12 or 13. Swimbladder with 2 retia mirabilia. **Colour:** dark brown or black.

Habitat, Distribution and Biology: Worldwide in warm temperate to tropical seas but absent on continental margins of the eastern Pacific and in the South Atlantic. Benthopelagic in about 500 to 1 600 m depth; occasionally taken in deep midwaters.

Size: To more than 65 cm total length.

Interest to Fisheries: ***Trachonurus sulcatus*** is commonly taken by trawlers in continental slope waters of the Gulf of Mexico along with the commercial royal red shrimp ***Pleoticus robustus***, but it is of no value. So far as known, none of the other species of this genus are taken in any quantity to be of fishery interest.

Literature: Parr (1946); Okamura (1970a); Marshall (1973).

Remarks: The genus constitutes a well-defined monophyletic unit of 6 or more. Parr (1946:79) synonymized ***T. asperrimus*** (Vaillant, 1888) with ***T. sulcatus*** (Goode & Bean, 1885); Marshall (1973:621) later synonymized that species and ***T. sentipellis*** Gilbert & Cramer, 1897, with ***T. villosus*** (Günther, 1877) and recognized only the last species. A study of Gilbert & Hubbs's (1920) material from the Philippines and East Indies has shown that these specimens constitute an undescribed species. Additional material recently collected off New Zealand and Australia has revealed two or more undescribed species. A cursory comparison of specimens of ***T. villosus*** from off Japan, ***T. sentipellis*** from Hawaii, and ***T. sulcatus*** from the Atlantic suggests that each represents a distinct species, but so far these ideas have not been documented.

A key to the species cannot be prepared until the results of further research become available.

Tentative List of Species :

Trachonurus sentipellis Gilbert & Cramer, 1897
Trachonurus sulcatus (Goode & Bean, 1885)
Trachonurus villosus (Günther, 1877)
Trachonurus species A (Philippines and Indonesia)
Trachonurus species B (New Zealand and Australia)
Trachonurus species C (Australia)

Trachonurus sulcatus (Goode & Bean, 1885)

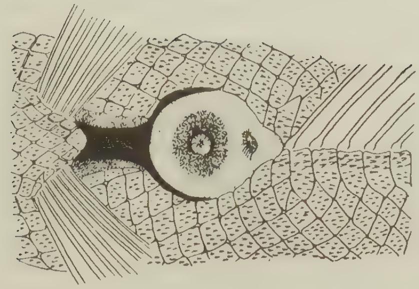
Fig. 663

MACROUR Tra 1

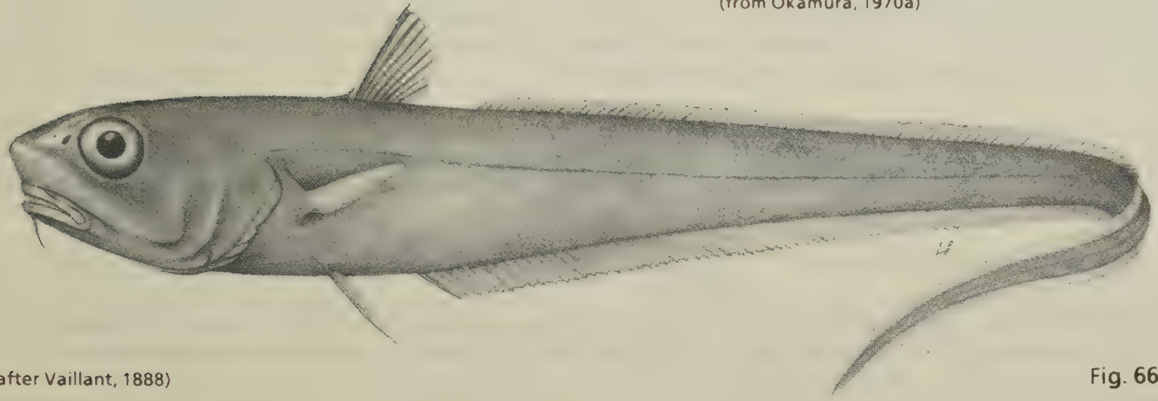
Scientific Name with Reference : ***Coryphaenoides sulcatus*** Goode & Bean, 1885, Proc. U.S. Natl. Mus., 8:596 (n. Gulf of Mexico; 28°38'30"N, 87°02'W in 768 m; ALBATROSS sta. 2394).

Synonyms : ***Coryphaenoides asperrimus*** Vaillant, 1888; ***Macrurus (Malacocephalus) sulcatus*** -- Günther, 1887; ***Trachonurus asperrimus*** -- Roule, 1919.

FAO Names : **En** - Bristly grenadier.



underside
(from Okamura, 1970a)



(after Vaillant, 1888)

Fig. 663

Diagnostic Features : Lateral snout profile broadly rounded (juveniles often have more pointed snouts); posterior nostril more than 2 times into suborbital; greatest body depth about equal to or more than postrostral length of head. Lateral line complete and well developed. Pelvic fin rays 7, rarely 6; pectoral fin rays i14 to i16. Pyloric caeca 9 to 13, short and thick, but not stumplike.

Geographical Distribution : Warm waters of the North Atlantic (Fig. 664).

Habitat and Biology : Benthopelagic in about 700 to 1 500 m depth.

Size : To about 50 cm total length.

Interest to Fisheries : Taken as bycatch of royal red shrimp (***Pleoticus robustus***) in continental slope waters of the Gulf of Mexico.

Literature : Vaillant (1888); Koefoed (1927); Parr (1946); Marshall (1973).

Remarks : The species is probably closest to the Pacific species ***T. villosus***, but its more rounded snout profile and its smaller posterior nostril are distinguishing.

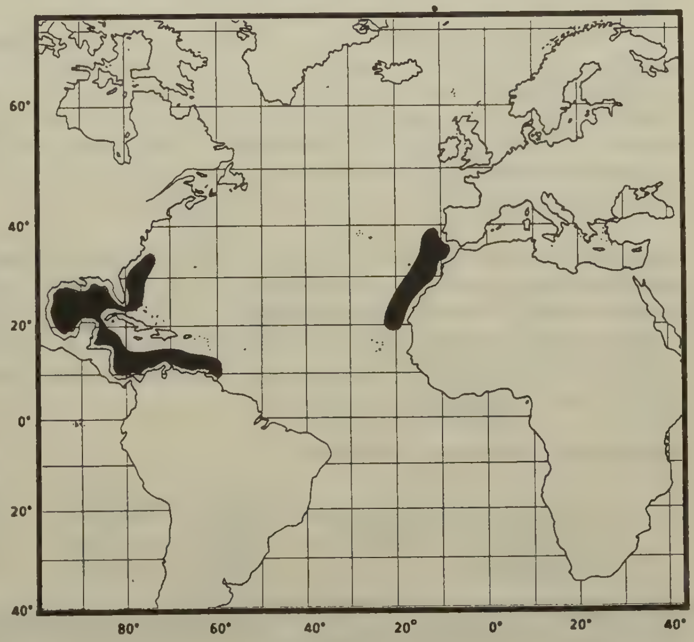


Fig. 664

Ventrifossa Gilbert & Hubbs, 1920

MACROUR Vent

Genus with Reference : ***Ventrifossa*** Gilbert & Hubbs, 1920 Bull. U.S. Natl. Mus., 100 (pt. 7):553 (type species ***Coryphaenoides garmani*** Jordan & Gilbert, 1904, by original designation).

Diagnostic Features: Macrourines with 7 branchiostegal rays. Snout moderately pointed to rounded; a small, poorly developed median tubercle on snout tip in a few species, lateral snout tubercles not developed; head without stout, coarsely scuted ridges, mouth subterminal, upper jaw usually more than 35% of head length. Teeth small, in narrow to moderately broad bands in upper jaw, outer series slightly enlarged in most species; lower jaw teeth small, none notably enlarged, in 1 to several series laterally. Anus removed from anal fin origin and closer to pelvic fin insertion, situated within an oval area of naked black skin (periproct); a small, round dermal window of light organ at anterior end of periproct, a second window anterior to periproct, situated in a shallow fossa between pelvic fin bases and generally separated from periproct by a series of small scales (but connected midventrally beneath scales by a narrow isthmus of black skin). No reticulate structures on scales; scale spinules short, fine, needle-like to broad, flat triangular; scale patches on branchiostegals present (subgenus ***Lucigadus***) or absent. Retia mirabilia and gas glands 2; retia rather short. Pyloric caeca numerous, usually 30 to 70.

Habitat, Distribution and Biology: Worldwide in mostly tropical to warm-temperate seas. Subgenera ***Ventrifossa*** and ***Sokodara*** absent on continental margins of the eastern Pacific and the eastern Atlantic. Subgenus ***Lucigadus*** in South Atlantic, Indian Ocean, and the western and southeastern Pacific. Benthopelagic in about 200 to 1 500 m depth.

Size: To more than 53 cm total length.

Interest to Fisheries: A few species occur in sufficient quantities to constitute part of the bycatch of trawlers fishing continental slope waters. Off southern Japan, one or more species are taken incidentally on bottom set-lines.

Literature: Gilbert & Hubbs (1920); Iwamoto (1979); Okamura (1970a, 1970b, 1982); Okamura in Okamura & Kitajima (1984).

Remarks: Of the three subgenera, ***Lucigadus*** appears to be the most derived, and its position within the tribe Malacocephalini remains somewhat obscure. Sazonov (1985) has accorded the group separate generic status, citing characters that suggest a closer relationship with ***Malacocephalus*** than with ***Ventrifossa***. However, until these characters are adequately surveyed within the group, better defined, and more rigorously evaluated, the present author is unable to use them to circumscribe the genus in the keys and diagnoses. Therefore, ***Lucigadus*** is maintained as a subgenus for this work. The inclusion of ***Lionurus japonicus*** Matsubara, 1943, in this genus is tentative in that the species shares the character of anterodorsal surface of snout and entire underside of head naked with the following genera: ***Asthenomacrurus*** Sazonov & Shcherbachev, 1982, ***Haplomacrurus*** Trunov, 1981, ***Macrosmia*** Merrett, Sazonov & Shcherbachev, 1983, ***Parakumba*** Trunov, 1981, and ***Pseudonezumia*** Okamura, 1970. None of the other members of ***Ventrifossa*** have extensive naked areas; only in a few members of ***Lucigadus*** does one find restricted naked areas along the ventral margins of the snout and suborbital region.

Ventrifossa appears to be most closely related to ***Malacocephalus***; a few species closely approach that genus in a number of shared characters and thereby cloud the distinctions between the two. Three derived features serve to separate ***Malacocephalus*** from ***Ventrifossa***: (1) enlarged, caninelike teeth on mandible; (2) large, halfmoon or bean-shaped anterior window of light organ; (3) short, broad, flat retia mirabilia. The presence of scale patches on the lowermost branchiostegal rays is common to ***Malacocephalus*** and subgenus ***Lucigadus***, but absent in the other two subgenera of ***Ventrifossa***.

Key to Adults of Genus *Ventrifossa*

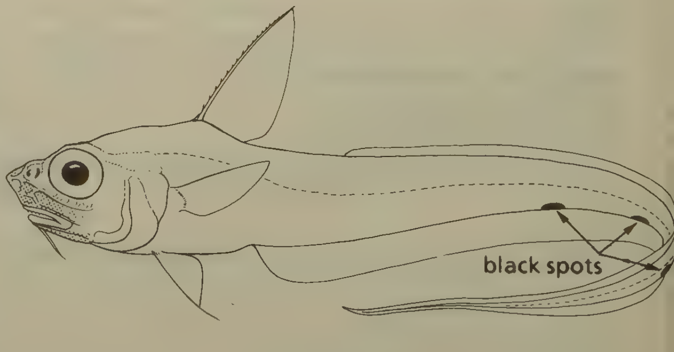
1a. Anterodorsal margin of snout and entire underside of head naked; 3 blackish spots along base of anal fin (Fig. 665) .... ***V. japonica***

1b. Snout and underside of head almost entirely scaled; no spots along anal fin base

  2a. Dorsal spine smooth

    3a. Pectoral fins more than 2/3 of head length .... ***V. macroptera***

    3b. Pectoral fins less than 2/3 of head length



V. japonica Fig. 665

4a. Enlarged spinules on scales of dorsum below interspace between dorsal fins in adults (Fig. 666) .... ***Ventrifossa*** species 1*

4b. No enlarged spinules on scales of dorsum

  5a. Barbel 12 to 20% of head length; orbit 32 to 40% of head length; outer gill slit 26 to 32% of head length .... ***V. atherodon***

  5b. Barbel 23 to 27% of head length; orbit 30 to 34% of head length; outer gill slit 23 to 26% of head length .... ***Ventrifossa*** species 2*

2b. Dorsal spine serrated

6a. Ventral parts of body appearing to have shifted forward so that anal fin origin often lies below first dorsal fin origin, pelvic fins below operculum, and the snout is short, bluntly rounded and high (Fig. 667a). Pores of head rather prominent. Scales present on lowermost branchiostegal rays. Tip and leading edge of snout without distinct pigmentation. Mandibular teeth in a narrow to wide band; premaxillary teeth not present posterior to hind margin of maxillary process. Spinules on scales in more or less parallel horizontal rows. Abdominal vertebrae 10 or 11 ...... Subgenus ***Lucigadus***

  7a. Pelvic fin rays fewer than 13

    8a. Pelvic fin rays 7 or 8 ...... ***V. lucifer***

    8b. Pelvic fin rays 10 to 12

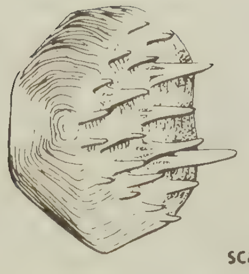
      9a. Bold bars and bands on body (Fig. 668) .. ***V. fasciata***

      9b. No bars and bands on body ...... ***V. nigromarginata***

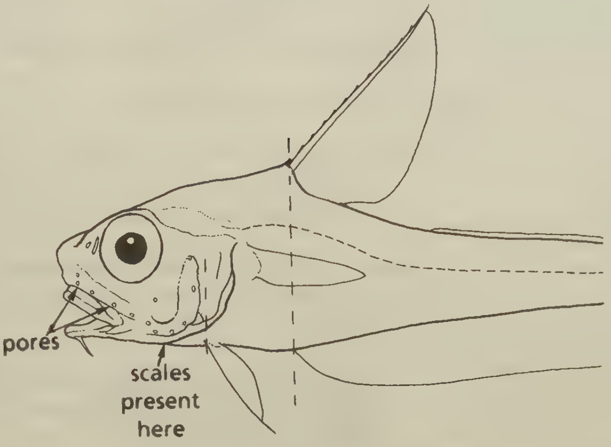
  7b. Pelvic fin rays 13 or more

    10a. Scales below first dorsal fin 9 or 10; first dorsal fin with 2 spines and 9 soft rays .... ***V. ori***

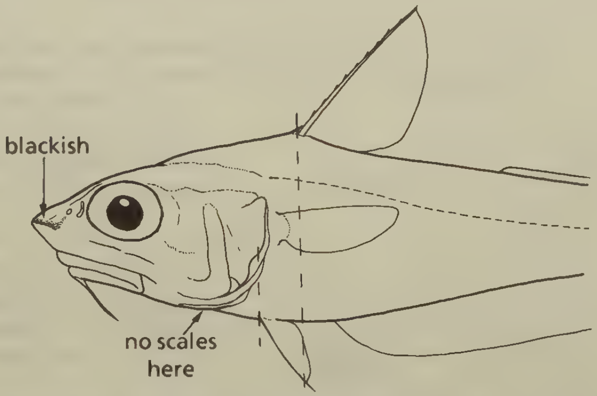
    10b. Scales below first dorsal fin 13 to 20; first dorsal fin with 2 spines and 10 or 11 soft rays .... ***V. nigromaculata***



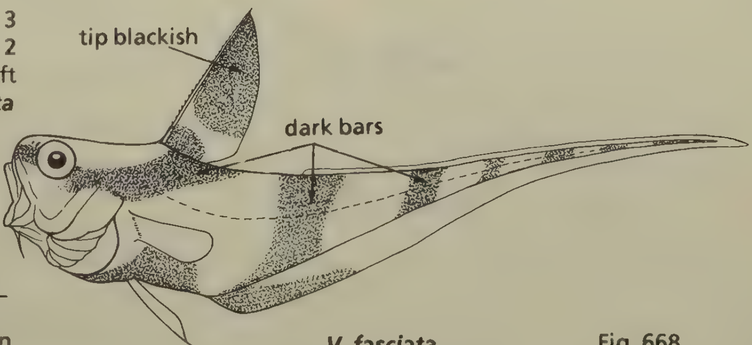
Ventrifossa species 1 Fig. 666



a. Subgenus ***Lucigadus***
(after Iwamoto, 1979)



b. Subgenus ***Ventrifossa*** Fig. 667



V. fasciata Fig. 668
(after Weber, 1913)

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* Species under study that will be described in the near future

6b. Ventral parts of body not especially far forward; anal fin origin below or behind posterior half of first dorsal fin; pelvic fins below or slightly forward of pectoral fin. Snout slightly to moderately pointed (Fig. 667b). Pores of head small, inconspicuous. No scales on branchiostegal membranes. Snout tip and usually also leading edge blackish (Fig. 669). Mandibular teeth in 1 to 3 irregular series laterally, premaxillary teeth present posterior to maxillary process. Scale spinules in "quincunx" order (Fig. 670 a) or in widely divergent rows. Abdominal vertebrae 11 to 15

11a. Tip of snout without any sign of modified tubercular scale. Snout barely protruding beyond large mouth, upper jaw 42 to 53% of head length, preoral length of snout usually less than 21% of head length; suborbital shelf not especially narrow anteriorly

12a. A prominent black blotch on first dorsal fin

13a. Anal fin with a black margin anteriorly .. ***V. rhipidodorsalis***

13b. No black margin on anal fin

14a. First dorsal fin with 2 spines and 12 or 13 rays; pelvic fins with 9 or 10 rays; lateral-line scales over predorsal length 50 to 53 .... ***V. ctenomelas***

14b. First dorsal fin with 2 spines and 8 or 10 rays; pelvic fin with 8 or 9 rays; lateral-line scales over predorsal length less than 47

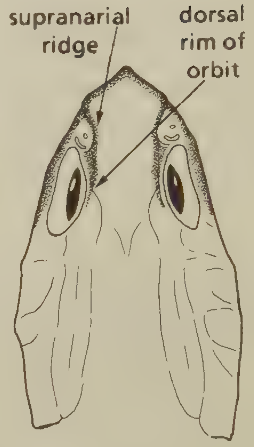
15a. Barbel equal to or more than orbit diameter; a large area of spinuleless scales behind first dorsal fin .... ***V. longebarbata***

15b. Barbel shorter than orbit diameter; spinuleless scales behind first dorsal fin present or absent

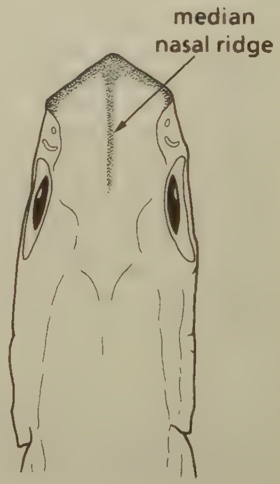
16a. Spinules blackish; supranarial ridges and dorsal rim of orbits blackish; orbit 26 to 30% of head length; a broad area of spinuleless scales behind first dorsal fin; preoral length 11 to 14.5% of head length (Fig. 669 a) .... ***V. petersoni***

16b. Spinules pale; supranarial ridges and orbit rim not blackish; orbit 29 to 33% of head length; few or no spinuleless scales behind first dorsal fin; preoral length 14 to 21% of head length .. ***V. nigrodorsalis***

12b. First dorsal fin uniformly dusky or somewhat darker basally



a. ***V. petersoni***



b. ***V. macropogon***

top of head Fig. 669

17a. Spinules on body scales broadly triangular (Fig. 670a.); scale rows below second dorsal fin 5 to 6.5 .... ***V. garmani***

17b. Spinules on body scales conical to narrowly lanceolate (Fig.670b); scale rows below second dorsal fin 6.5 to 10

18a. Median nasal ridge blackish (Fig. 669b)...................................... ***V. macropogon***

18b. Median nasal ridge not blackish

19a. Barbel short, 16 to 25% of head length

20a. First dorsal fin with 2 spines and 9 or 10 rays; interorbital width 18 to 22% of head length; body depth less than 2/3 of head length ...... ***Ventrifossa*** species 3

20b. First dorsal fin with 2 spines and 11 to 13 rays; interorbital width 24 to 28% of head length; body depth more than 2/3 of head length .... ***V. mucocephalus***

19b. Barbel long, more than 25% of head length

21a. First dorsal and pelvic fins dark; scale pockets brown; barbel 115 to 133% of orbit .. ***V. saikaiensis***

21b. First dorsal and pelvic fins pale; scale pockets not dark-edged; barbel 82 to 115% of orbit .... ***V. divergens***

11b. Tip of snout with a small spiny scute; snout distinctly pointed, protruding well beyond mouth; preoral length usually more than 21% of head length (Fig. 671)

22a. Scales large, rows below second dorsal fin 5 to 6.5, about 40 lateral-line scales over distance equal to predorsal length; barbel 18 to 21% of head length .... ***V. nasuta***

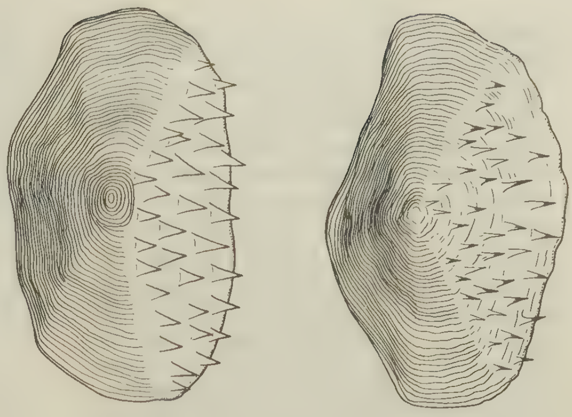
22b. Scales small, rows below second dorsal fin 9 to 11, about 60 to 75 lateral-line scales over distance equal to predorsal length; barbel less than 17% of head length

23a. Oral cavity pale; barbel 4 to 8% of head length

24a. Colour dark, fins blackish .... ***V. fusca***

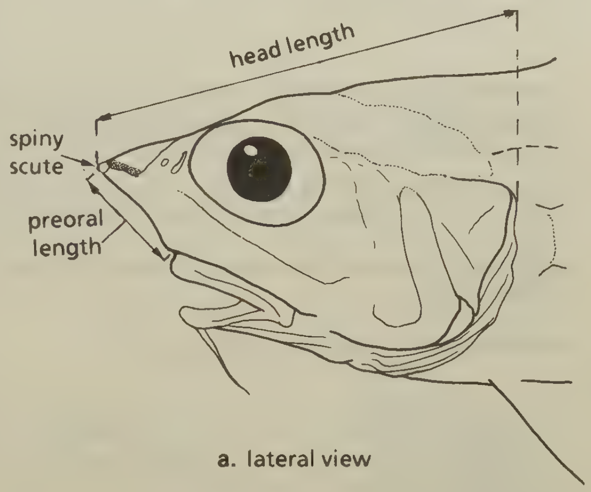
24b. Colour medium brown, fins dusky to pale .... ***V. misakia***

23b. Oral cavity blackish; barbel 11 to 16% of head length .... ***V. johnboborum***

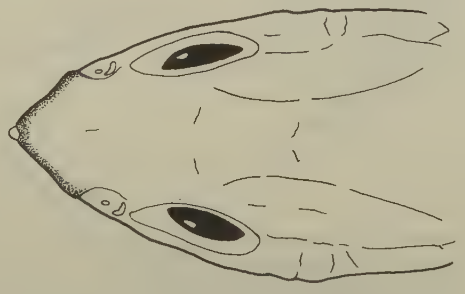


a. ***V. garmani*** (after Okamura, 1970a)   b. ***V. macropogon***

scales   Fig. 670



a. lateral view



b. top of head   Fig. 671

List of Species

Ventrifossa atherodon (Gilbert & Cramer, 1897)
Ventrifossa ctenomelas (Gilbert & Cramer, 1897)
Ventrifossa divergens Gilbert & Hubbs, 1920
Ventrifossa fasciata (Weber, 1913)
Ventrifossa fusca Okamura, 1982
Ventrifossa garmani (Jordan & Gilbert, 1904)
Ventrifossa japonica (Matsubara, 1943)
Ventrifossa johnboborum Iwamoto, 1982
Ventrifossa longebarbata Okamura, 1982
Ventrifossa lucifer (Smith & Radcliffe, 1912)
Ventrifossa macropogon Marshall, 1973
Ventrifossa macroptera Okamura, 1982
Ventrifossa misakia (Jordan & Gilbert, 1904)
Ventrifossa mucocephalus Marshall, 1973
Ventrifossa nasuta (Smith, 1935)
Ventrifossa nigrodorsalis Gilbert & Hubbs, 1920
Ventrifossa nigromaculata (McCulloch, 1907)
Ventrifossa nigromarginata (Smith & Radcliffe, 1912)
Ventrifossa ori (Smith, 1968)
Ventrifossa petersoni (Alcock, 1889)
Ventrifossa rhipidodorsalis Okamura, 1984
Ventrifossa saikaiensis Okamura, 1984

Ventrifossa atherodon (Gilbert & Cramer, 1897)

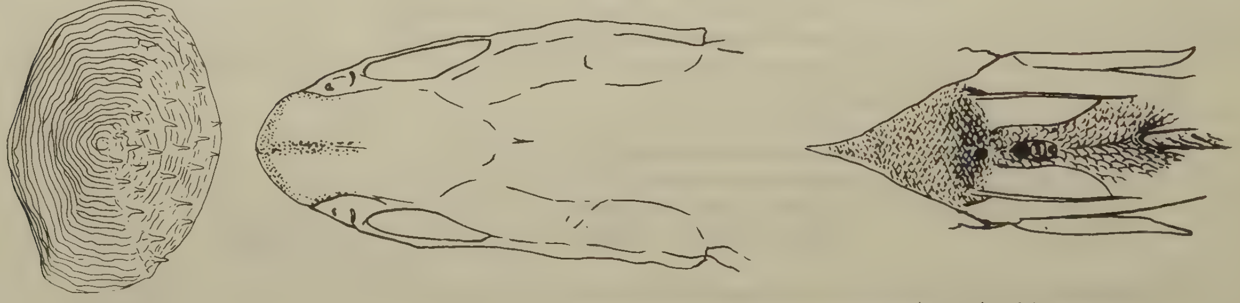
Fig. 672

MACROUR Vent 1

Scientific Name with Reference : ***Optonurus atherodon*** Gilbert & Cramer, 1897, Proc. U.S. Natl. Mus., 19(1114): 431, pl. 46, fig. 1 (Kaiwi Channel, Hawaiian Is.; 21°12'N, 159°38'30"W; 686 m; ALBATROSS sta. 3474).

Synonyms : ***Lionurus (Nezumia) atherodon*** -- Gilbert & Hubbs, 1916; ***Ventrifossa (Atherodus) atherodon*** -- Gilbert & Hubbs, 1920.

FAO Names : En - Arrowtooth grenadier.



scale top of head underside

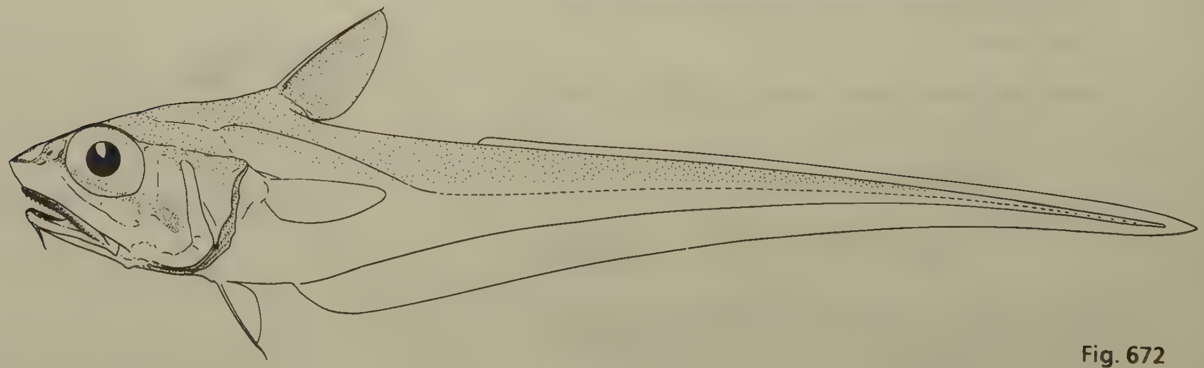


Fig. 672

Diagnostic Features : Teeth in premaxillae in broad bands, those in outer series distinctly enlarged, conical, recurved canines with arrowhead-shaped tips; mandibular teeth in 2 irregular series, the inner series slightly enlarged. Inner gill rakers on first arch 18 to 20 (total). Measurements in percentages of head length: snout 25 to 30; preoral 9 to 15 (usually 10 to 12); orbit diameter 28 to 38; interorbital space 21 to 28; distance orbit to angle of preopercle 39 to 46; upper jaw length 46 to 53; barbel length 13 to 22; outer gill slit 25 to 32; body depth under first dorsal fin origin 71 to 92; length of pectoral fin 57 to 63. First dorsal fin with 2 spines and 9 or 10 rays, first spinous ray lacking serrations; pectoral fin rays i20 to i23; pelvic fin rays 9 or 10. Scales small; spinules very small, short, conical, erect; scale rows below second dorsal fin origin 7 or 8 over a distance equal to predorsal length 47 to 56. Snout with black margins along leading edge, supranarial ridges, and a median nasal ridge; first dorsal fin uniformly dusky.

Geographical Distribution : Apparently confined to the Hawaiian Islands. Specimens reported from other areas probably represent different species (Fig. 673).

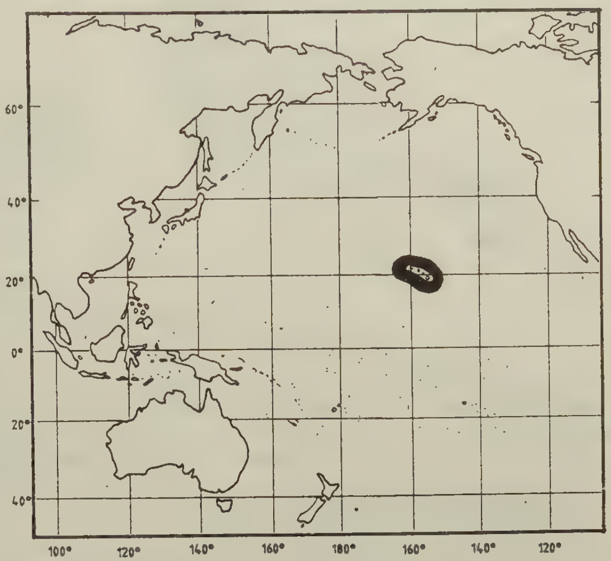


Fig. 673

Habitat and Biology : Benthopelagic in 302 to 936 m depth. Gilbert (1905) reports the food to consist of shrimp-like crustacea and squids.

Size : To more than 31 cm total length.

Interest to Fisheries : Gilbert (1905) considered this as "One of the most abundant of Hawaiian ***Macrurids*** between 250 and 400 fathoms." The absence of a deep-water trawl fishery in the Hawaiian Islands, however, precludes their capture other than by research vessels.

Local Names : USA : Arrow-toothed grenadier.

Literature : Gilbert & Cramer (1897); Gilbert (1905); Gilbert & Hubbs (1920).

Remarks : Three closely related species are known: one undescribed species recently taken off the Sala-Gomez and Nazca ridges in the southeastern Pacific is distinguished by its distinctly longer barbel (23 to 27% of head length) and smaller outer gill slit (23 to 26% head length); another undescribed species taken in the South China Sea has enlarged spinules on scales below the second dorsal fin and a slightly longer barbel (1.4 to 1.8 in orbit vs. 1.8 to 2.8); a third species, ***V. macroptera*** Okamura, 1982, from the Kyushu-Palau Ridge has a much longer pectoral fin (more than 2/3 head length) and a smaller orbit (26 to 31% of head length).

Ventrifossa ctenomelas (Gilbert & Cramer, 1897)

Fig. 674

MACROUR Vent 2

Scientific Name with Reference : ***Chalinura ctenomelas*** Gilbert & Cramer, 1897, Proc. U.S. Natl. Mus., 19(1114): 430, pl. 45, fig. 2 (Kaiwi Channel, Hawaiian Is.; 21°08'30"N, 157°49'W; 627 m; ALBATROSS sta. 3470).

Synonyms : ***Lionurus (Nezumia) ctenomelas*** -- Gilbert & Hubbs, 1916; ***Ventrifossa (Ventrifossa) ctenomelas*** -- Gilbert & Hubbs, 1920.

FAO Names : **En** - Hawaiian grenadier.

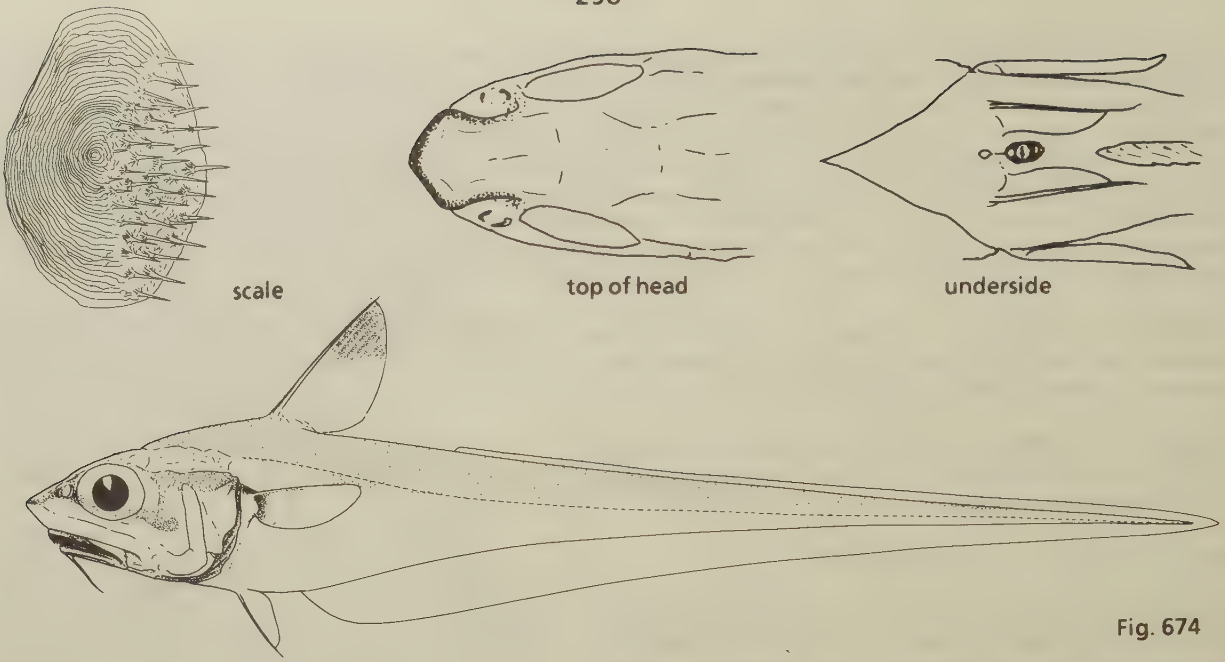


Fig. 674

Diagnostic Features : Teeth in premaxilla in a moderately wide band, outer series distinctly enlarged, widely spaced conical canines; mandibular teeth in 2 irregular series laterally, the inner series slightly enlarged. Inner gill rakers on first arch 15 or 16 total. First dorsal fin with 2 spines and 10 or 11 (rarely 9) rays, second spinous ray finely serrated; pectoral fin rays i20 to i22; pelvic fin rays 9 or 10 (rarely 8). Measurements in percentages of head length: snout length 26 to 31; preoral length 13 to 18; orbit diameter 31 to 38; interorbital space 20 to 25; distance orbit to angle of preopercle 36 to 44; length upper jaw 40 to 46; length barbel 22 to 28; length outer gill slit 21 to 25; body depth under first dorsal origin 75 to 86; length pectoral fin 48 to 58. Scales small, uniformly covered with small, fine, conical spinules; scale rows below second dorsal origin 8, over a distance equal to predorsal length 50 to 53. Snout with a black margin along leading edge and supranarial ridges, but not along median nasal ridge; first dorsal fin with a large black blotch across middle to distal portions.

Geographical Distribution : Apparently confined to the Hawaiian Islands (Fig. 675).

Habitat and Biology : Benthopelagic in 411 to 673 m depth. Gilbert (1905) has reported shrimplike crustacea and squid beaks in the stomachs of specimens he examined.

Size : To more than 31 cm total length.

Interest to Fisheries : Gilbert (1905) reported the species as very abundant in depths of 250 to 350 fathoms [457 to 640 m]. As with other Hawaiian macrourids, is not normally taken by commercial fishermen because of the absence of a deep-water trawl fishery in the islands .

Local Name : USA : Common grenadier.

Literature : Gilbert & Cramer (1897); Gilbert (1905); Gilbert & Hubbs (1920).

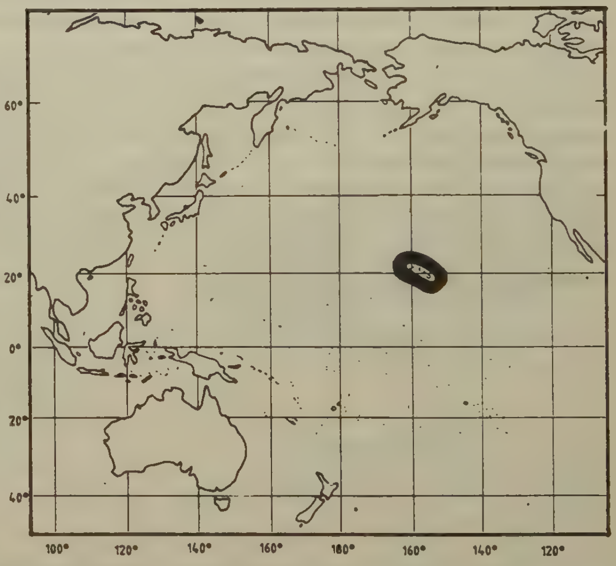


Fig. 675

Remarks : ***Ventrifossa ctenomelas*** is readily distinguished from its close relatives with a black-blotched first dorsal fin by its high first dorsal ray count and small scales (as reflected in the count of lateral-line scales over a distance equal to the predorsal measurement). It further differs from ***V. rhipidodorsalis*** by its shorter pectoral fin (58.7 to 68.2% of head length*), from ***V. longebarbata*** by its shorter pectoral fin 59 to 67%) and shorter barbel (102 to 127% of orbit*), and from ***V. nigrodorsalis*** by its somewhat higher range of pelvic fin rays (8 or 9) and inner gill raker counts (13 to 15) and slightly longer barbel (18 to 23% of head length).

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* Data from Okamura, 1982, 1984.

Ventrifossa divergens Gilbert & Hubbs, 1920

Fig. 676

Scientific Name with Reference : ***Ventrifossa divergens*** Gilbert & Hubbs, 1920, Bull. U.S. Natl. Mus. 100, 1(7): 549, fig. 37 (Sibuko Bay, Borneo; 4°12'44"N, 118°27'44"E; 557 m; ALBATROSS sta. 5592).

Synonyms : None

FAO Names : **En** - Plainfin grenadier.

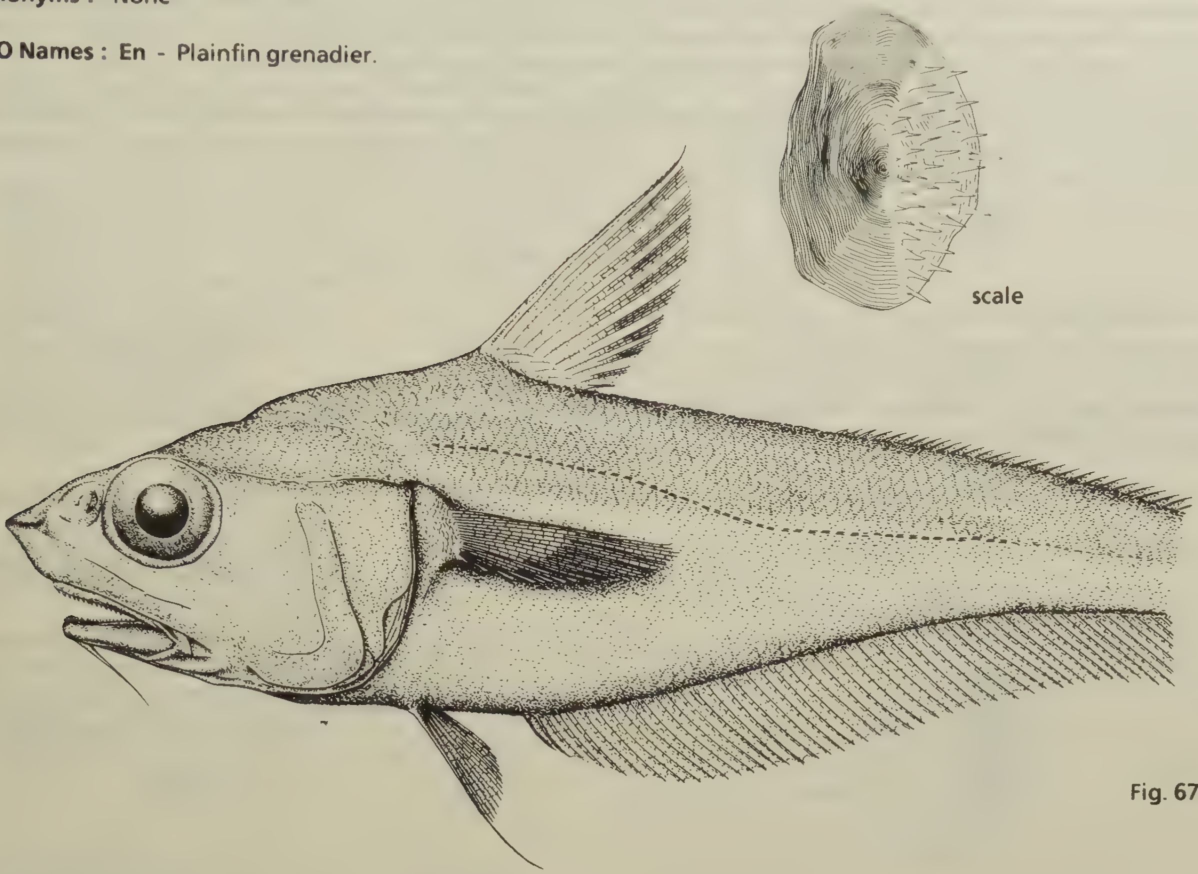


Fig. 676

Diagnostic Features : Teeth small, in broad bands in premaxilla, outer series slightly enlarged, some with arrowhead tips; mandibular teeth in a rather narrow band. Inner gill rakers on first arch 15 to 17 total. First dorsal fin with 2 spines and 9 to 11 rays, spinous ray finely serrated along leading edge; pectoral fin rays i19 to i23; pelvic fin rays 8 or 9. Measurements in percentages of head length: snout length 25 to 31; preoral length 15 to 19; orbit diameter 28 to 37; interorbital space 26 to 30; distance orbit to angle of preopercle 41 to 45; length upper jaw 43 to 49; length pectoral fin 56 to 57. Scales medium-sized, uniformly covered with fine, conical reclined spinules in widely divergent V rows or quincunx order; scale rows below second dorsal fin 8 to 10 over distance equal to predorsal length 43 to 48. Snout with a black margin along leading edge extending posteriorly onto suborbital shelf, but not over supranarial and median nasal ridges; first dorsal fin uniformly dusky or darker proximally, but lacking a distinct black blotch.

Geographical Distribution : Philippines, South China Sea near Hong Kong, Borneo, and Indian Ocean off South Africa and Mozambique (Fig. 677).

Habitat and Biology : Benthopelagic in 183 to 772 m depth, but most common in about 350 to 550 m.

Size : To about 30 cm total length.

Interest to Fisheries : Apparently a fairly common species in the Philippines and southern Africa, but no catch statistics are available.

Literature : Gilbert & Hubbs (1920); Barnard (1925b); Iwamoto (in Smith & Heemstra, 1986).

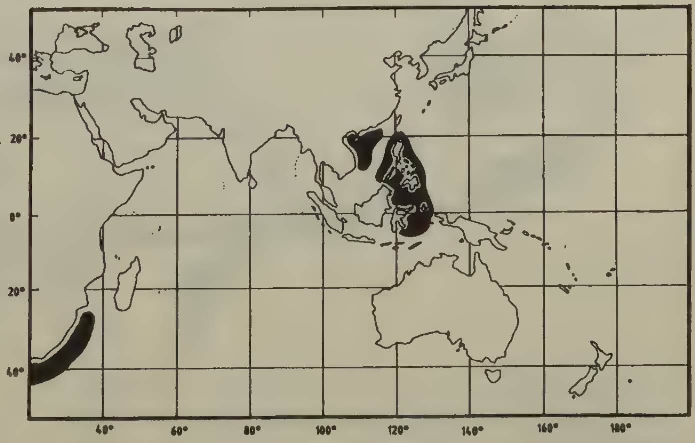


Fig. 677

Remarks : *Ventrifossa divergens* appears to be closely related to ***V. saikaiensis***, ***V. macropogon***, and ***V. longebarbata***, and perhaps more distantly to ***V. rhipidodorsalis***. It differs from ***V. longebarbata*** primarily in lacking the distinct black blotch on the first dorsal, and in having a shorter interspace between dorsal fins (38 to 58% of head length vs. 63 to 71%*), a longer postorbital (41 to 44% vs. 39 to 41%*), a shorter pectoral fin (59 to 67%* in ***longebarbata***), and a somewhat broader interorbital space (24 to 30% vs. 23 to 24%*). ***V. saikaiensis*** and ***V. macropogon*** share in common with ***V. divergens*** the features of lacking a black-blotched first dorsal, pelvic fin rays 8 or 9, and a long barbel, but ***V. saikaiensis*** has fewer rows of scales below the origin of second dorsal fin, a broader area of spinuleless scales behind the first dorsal, and a somewhat longer pectoral fin (61.4 to 72.2% of head length*); ***V. macropogon*** is distinguished by its somewhat higher first dorsal fin ray count (2 spines and 11 to 14 rays, usually 12 or 13), somewhat fewer inner gill rakers of first arch (13 to 15, rarely 16 total), fewer lateral-line scales over distance equal to predorsal length (38 to 43). ***V. rhipidodorsalis*** has, in addition to a black-blotched first dorsal fin, somewhat more pelvic rays (9 or 10), fewer lateral-line scales over a distance equal to the predorsal length (39 to 41), a narrower interorbital space (20.7 to 25.6% of head length*), and a longer pectoral fin (58.7 to 68.2% of head length*).

Ventrifossa garmani (Jordan & Gilbert, 1904)

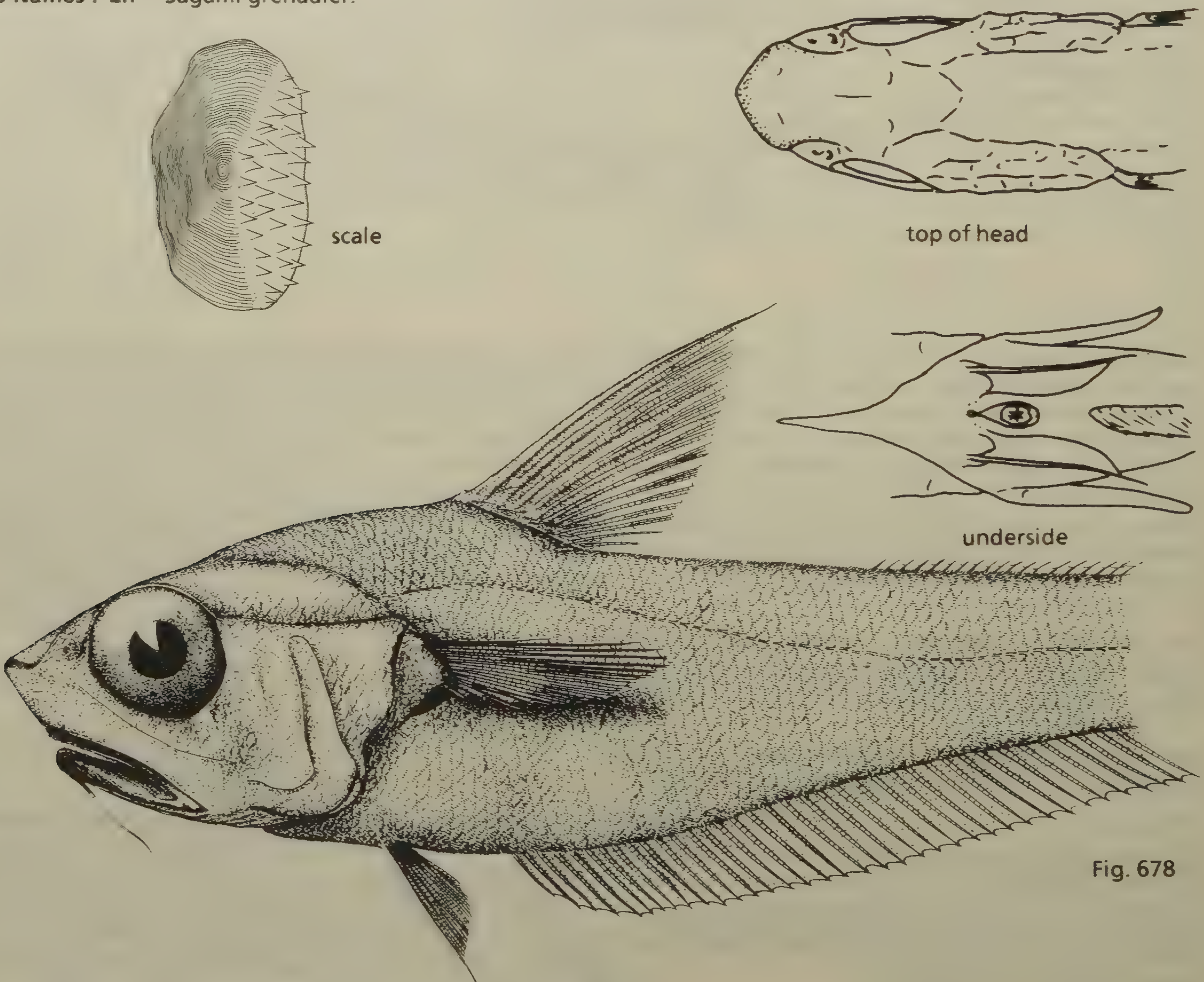
Fig. 678

MACROUR Vent 4

Scientific Name with Reference : ***Coryphaenoides garmani*** Jordan & Gilbert, in Jordan & Starks, 1904, Bull. U.S. Fish Comm. 22 (1902): 610 (Sagami Bay, Japan; 201-474 m; ALBATROSS sta. 3695).

Synonyms : ***Lionurus (Nezumia) garmani*** -- Gilbert & Hubbs, 1916; ***Ventrifossa garmani*** -- Gilbert & Hubbs, 1920

FAO Names : **En** - Sagami grenadier.



scale

top of head

underside

Fig. 678

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* Data from Okamura in Okamura et al. (1982, 1984)

Diagnostic Features : Teeth all small, in broad bands in premaxillae, outer series scarcely enlarged; mandibular teeth in moderately wide bands. Inner gill rakers on first arch 16 to 19 total. First dorsal fin with 2 spines and 10 or 11 rays, second spinous ray finely serrated; pectoral fin rays i18 to i23; pelvic fin rays 8 or 9. Measurements in percentages of head length: snout length 26 to 31; preoral height 16 to 23; orbit diameter 31 to 38; interorbital space 27 to 34; distance orbit to angle of preopercle 41 to 46; length upper jaw 41 to 47; length barbel 23 to 32; length outer gill slit 24 to 30; length pectoral fin about 55 to 65. Scale rows below second dorsal fin 5 to 6.5, over a distance equal to predorsal length 38 to 42. Scales medium-sized, uniformly covered with broad, short, triangular spinules in widely divergent V rows or irregularly quincunx order. Snout with a black margin along leading edge only; first dorsal fin uniformly dusky or darker proximally, but lacking a distinct black blotch.

Geographical Distribution : Southern Japan and East China Sea (Fig. 679).

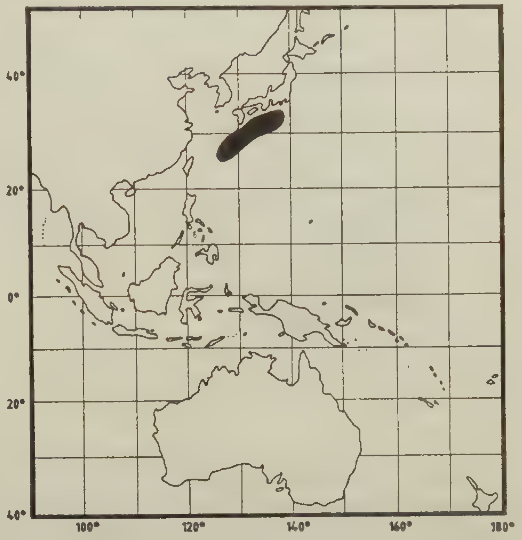


Fig. 679

Habitat and Biology : Benthopelagic in 200 to 720 m depth, but most common in about 350 to 550 m where water temperatures range from 6° to 12°C. Feeds primarily on euphausiids, prawns, and isopods. Spawning probably takes place in early spring.

Size : To about 31 cm total length.

Interest to Fisheries : A common species off southern Japan, especially abundant in Tosa Bay and Kumano-Nada. Taken in trawls and bottom longlines, but no catch statistics are available.

Local Names : JAPAN: Sagami-sokodara.

Literature : Jordan & Gilbert (in Jordan & Starks, 1904); Okamura (1970a, 1982).

Remarks : *Ventrifossa garmani* is most closely similar in general features to ***V. divergens*** and ***V. saikaiensis*** but is readily differentiated from the two by its triangular scale spinules and lower scale counts.

Ventrifossa macropogon Marshall, 1973

Fig. 680

MACROUR Vent 5

Scientific Name with Reference : ***Ventrifossa macropogon*** Marshall, 1973, Mem. Sears Found. Mar. Res. 1 (pt. 6): 658, fig. 52 (Caribbean Sea off Nicaragua; 16°35'N, 80°10'W; 576 m; OREGON sta. 1980).

Synonyms : None.

FAO Names : En - Longbeard grenadier.

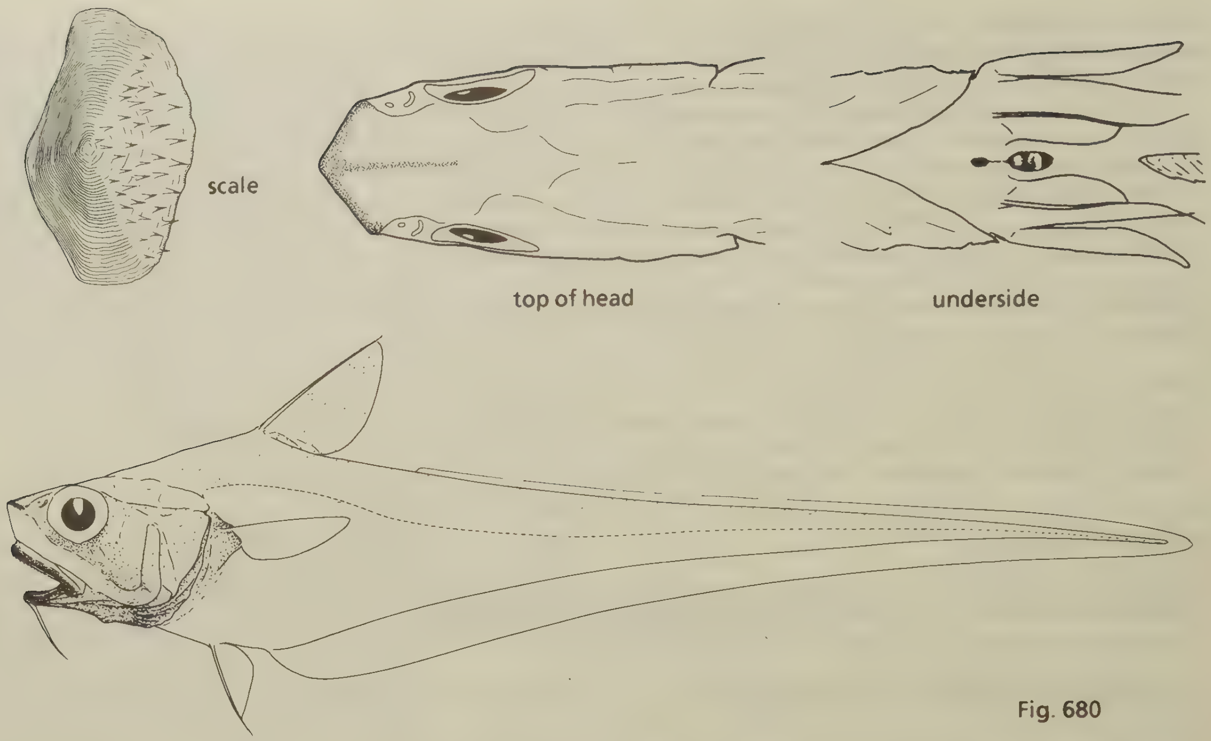


Fig. 680

Diagnostic Features : Teeth in premaxillae in broad bands, outer series slightly enlarged; mandibular teeth in narrow bands, 2 to 4 teeth wide. Inner gill rakers on first arch 13 to 15 (rarely 16) total. First dorsal with 2 spines and 12 or 13 rays (rarely 11 or 14), second spinous ray serrated along leading edge; pectoral fin rays i20 to i22; pelvic fin rays 9 or 10. Measurements in percentages of head length: snout length 26 to 34; preoral length 13 to 21; orbit diameter 29 to 33; interorbital space 23 to 28; upper jaw 38 to 49; barbel length 31 to 43; length of outer gill slit 23 to 29. Scale rows below second dorsal fin origin 7 to 9; lateral-line scales over a distance equal to predorsal length 41 to 49; scales fairly large, covered with slender conical spinules in quincunx order. Snout with black margins along leading edge, supranarial ridges, median nasal ridge, and dorsally on suborbital. Gums of lower jaw blackish; first dorsal fin uniformly blackish to dusky.

Geographical Distribution : Western tropical Atlantic from off Guyana into the Caribbean and the Gulf of Mexico, and in Atlantic off northeastern Florida (Fig. 681). Common to the south of the Gulf of Mexico, but relatively rare in the Gulf and Gulf Stream.

Habitat and Biology : Benthopelagic in 439 to 1 000 m depth; most common in about 500 to 600 m.

Size : To at least 45 cm total length.

Interest to Fisheries : Occasionally taken in royal red shrimp grounds, especially in the Caribbean.

Literature : Marshall (1973).

Remarks : In the western Atlantic, the species is likely to be confused only with ***Malacocephalus occidentalis*** and ***V. mucocephalus*** with which it is sometimes taken. ***Ventrifossa macropogon*** can be readily differentiated from the first by that species' strong uniserial mandibular dentition, fewer gill rakers, very narrow snout, white gums, and broad, bean-shaped ventral fossa; and from the second by that species' shorter barbel, anteriorly narrowed suborbital shelf, lack of black margins on the supranarial and median nasal ridges, white gums, and somewhat fewer pelvic rays (8 or 9, usually 8).

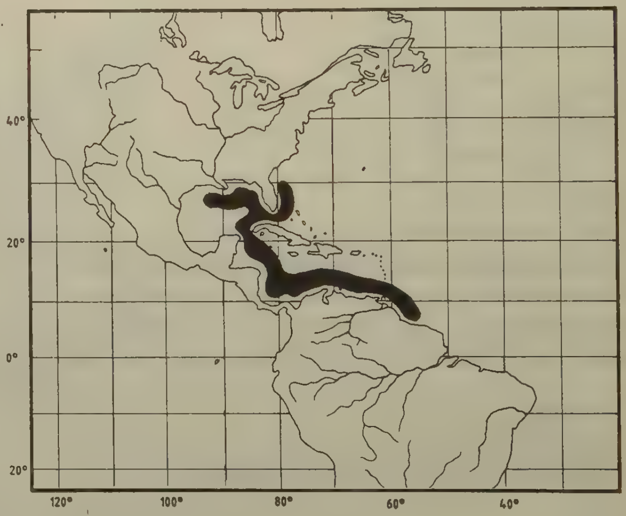


Fig. 681

Ventrifossa macroptera Okamura, 1982

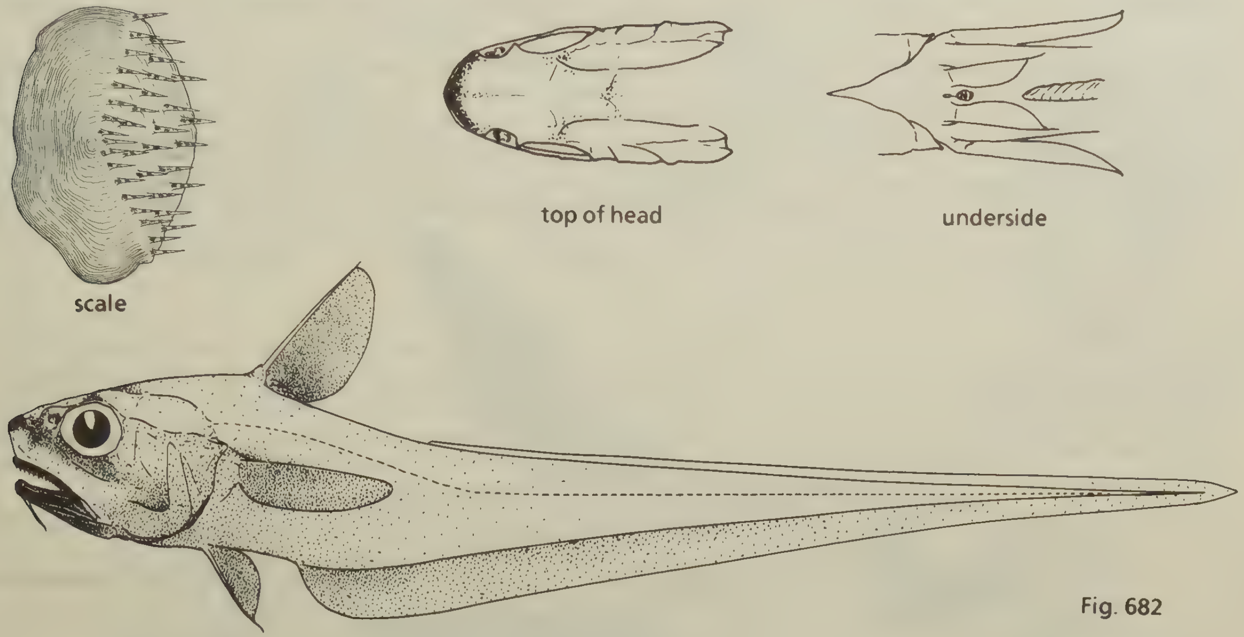
Fig. 682

MACROUR Vent 6

Scientific Name with Reference : ***Ventrifossa macroptera*** Okamura, 1982, Fishes Kyushu-Palau Ridge & Tosa Bay, Jpn. Fish. Resource Conserv. Assoc.: Tokyo: 148 (Kyushu-Palau Ridge; 27°55.1'N, 134°44.8'E; 685-710 m).

Synonyms : None.

FAO Names : En - Palau grenadier.


scale

top of head

underside

Fig. 682

Diagnostic Features : Premaxillary teeth in narrow bands 4 or 5 teeth wide, outer series enlarged with arrowhead-like tips; mandibular teeth in 2 series, the inner larger. Inner gill rakers on first arch 16 to 18 total. First dorsal fin with 2 spines and 9 to 11 rays, second spinous ray smooth; pectoral fin rays i19 to i25; pelvic fin rays 9 or 10. Measurements in percentages of head length: snout length 28 to 32; preoral length 14 to 15; orbit diameter 28 to 31; interorbital space 30 to 32; orbit to angle of preopercle 45 to 49; length of upper jaw 47 to 51; barbel length 20 to 25; length of outer gill slit 27 to 30; length of pectoral fin 67 to 77. Scale rows below midbase of first dorsal fin 6.5 to 7.5, below second dorsal origin 8 to 10; lateral-line scales over a distance equal to predorsal length 49 to 55. Scales covered with slender, sharp spinules in widely divergent V rows or irregularly in quincunx order. Snout with a black margin along leading edge and posteriorly over half of supranarial ridges; first dorsal fin uniformly blackish or dusky.

Geographical Distribution : Known only from the Kyushu-Palau Ridge (Fig. 683).

Habitat and Biology : Benthopelagic in 685 to 710 m depth. Females with ripe eggs were taken in mid-December.

Size : To about 40 cm total length.

Interest to Fisheries : Captured in fair numbers during exploratory fishing on the Kyushu-Palau Ridge, but not known from any other area.

Local Names : JAPAN : Parao-sokodara.

Literature : Okamura in Okamura, Amaoka & Mitani, eds (1982).

Remarks : See Remarks under ***Ventrifossa atherodon*** for comparisons with other similar species.

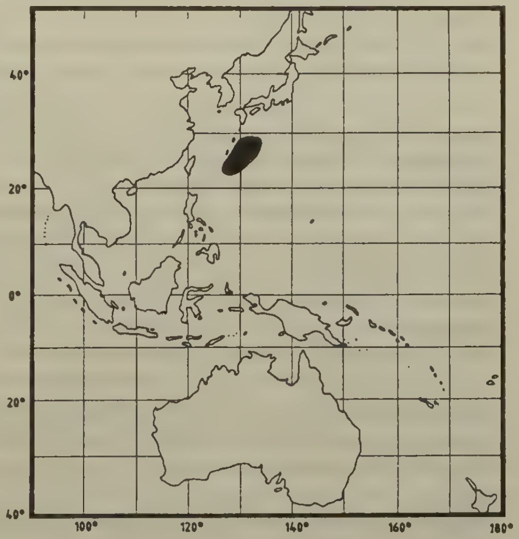


Fig. 683

Ventrifossa misakia (Jordan & Gilbert, 1904)

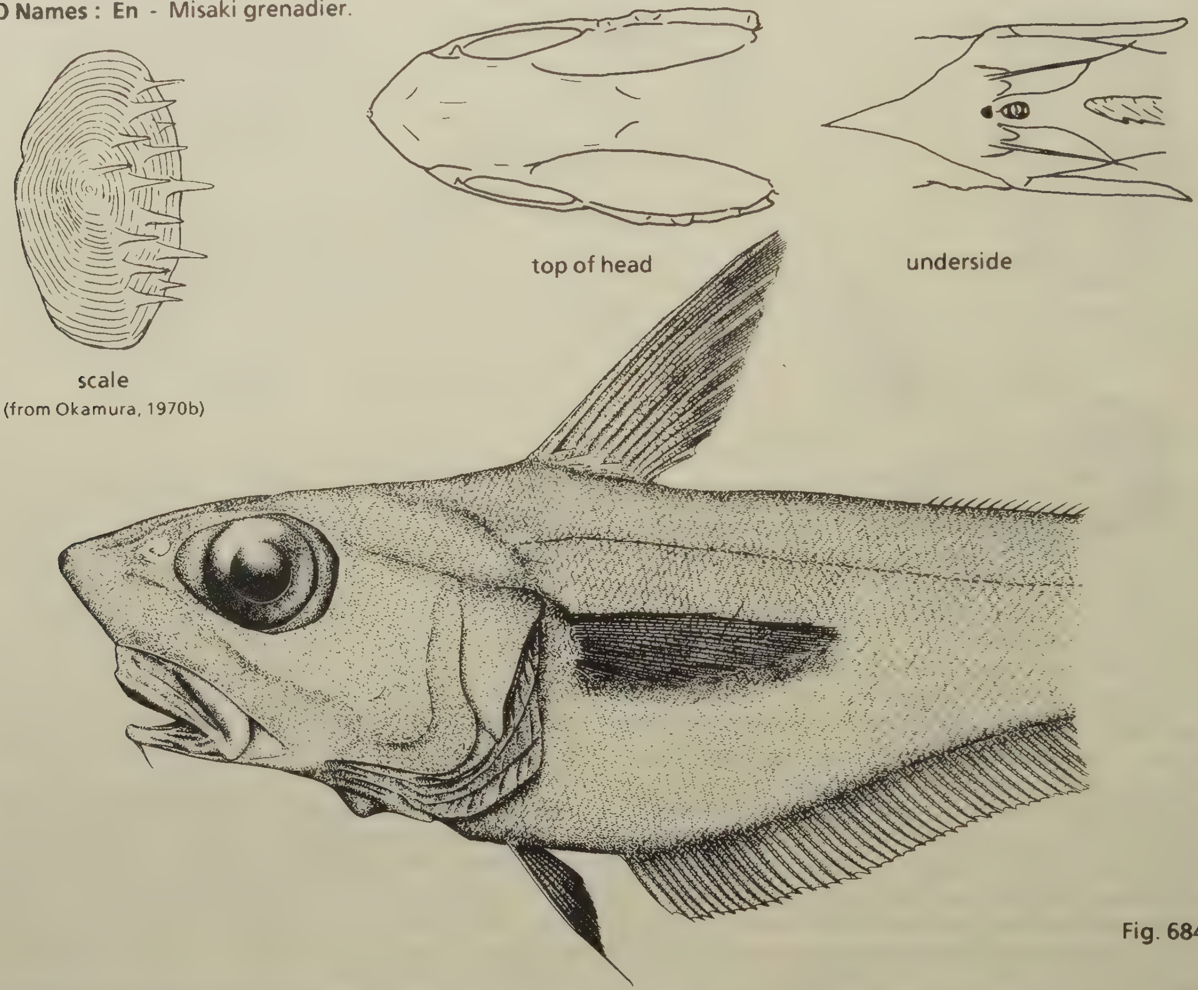
Fig. 684

MACROUR Vent 7

Scientific Name with Reference : ***Coryphaenoides misakius*** Jordan & Gilbert, in Jordan & Starks, 1904, Bull. U.S. Fish Comm. 22 (1902): 611 (Sagami Bay, Japan).

Synonyms : ***Macrourus asper*** -- Jordan & Thompson, 1914; ***Lionurus (Nezumia) misakius*** -- Gilbert & Hubbs, 1916; ***Ventrifossa misakia*** -- Gilbert & Hubbs, 1920.

FAO Names : En - Misaki grenadier.



scale
(from Okamura, 1970b)

top of head

underside

Fig. 684

Diagnostic Features : Teeth small, in narrow bands about 3 rows wide in premaxillae, outer series slightly enlarged; mandibular teeth in 2 irregular series, the inner teeth slightly larger. Inner gill rakers of first arch 14 or 15 total. First dorsal fin with 2 spines and 10 or 11 rays, second spinous ray finely serrated; pectoral fin rays i19 to i22; pelvic fin rays 8. Measurements in percentages of head length: snout length 26 to 32; preoral length 21 to 27; orbit diameter 29 to 38 (relative size decreases with age); interorbital space 30 to 35; distance orbit to angle of preopercle 39 to 46; length of upper jaw 35 to 42; barbel length 4 to 8; length outer gill slit 19 to 25; length of pectoral fin about 40 to 60. Scales very small, sparsely covered with slender conical to lanceolate spinules in widely divergent V rows; scale rows below origin of second dorsal fin 9 to 9.5; lateral-line scales over a distance equal to predorsal length 66 to 76. Snout of young individuals with faint blackish margin along leading edge, older individuals appear to have only a blackish snout tip; first dorsal fin uniformly dusky.

Geographical Distribution : Japan, from Choshi (about 36°N) to Kagoshima (in East China Sea) (Fig. 685).

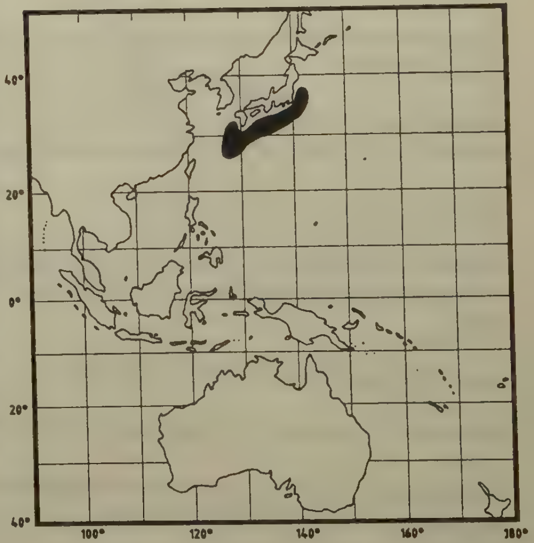


Fig. 685

Habitat and Biology : Benthopelagic in about 400 m depth. Feeds primarily on euphausiids, prawns, and isopods. Spawning probably takes place from January through March.

Size : To about 40 cm total length.

Interest to Fisheries : Taken occasionally off southern Japan, but no catch statistics are available.

Local Names : JAPAN : Misaki-sokodara

Literature : Jordan & Gilbert (in Jordan & Starks, 1904); Okamura (1970a).

Remarks : ***Ventrifossa misakia*** is closely related to ***V. fusca*** and ***V. johnboborum***, sharing with these species a similar squamation, general physiognomy, light organ structure, and trunk vertebrae count (14). No sharp differences are apparent to distinguish the species from ***V. fusca***, aside from that species' seemingly darker body, presence of a gular scale patch, and more numerous spinules on body scales. ***V. johnboborum*** can be distinguished from ***V. misakia*** by its slightly higher pelvic fin ray count (9 or 10), longer barbel (10 to 14% of head length), slightly longer interspace between the dorsal fins (35 to 41% of head length vs. 30 to 35%), and longer distance anus to anal fin origin (20 to 26% of head length vs. 11 to 15%).

Ventrifossa mucocephalus Marshall, 1973

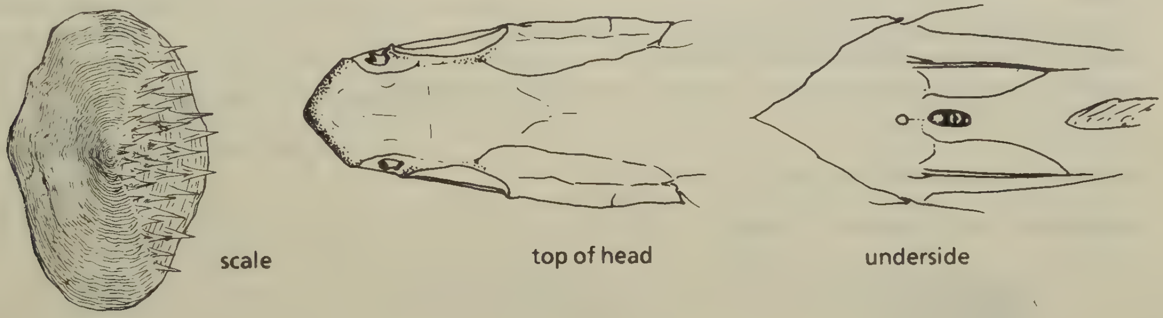
Fig. 686

MACROUR Vent 8

Scientific Name with Reference : ***Ventrifossa mucocephalus*** Marshall, 1973, Mem. Sears Found. Mar. Res. 1 (pt. 6): 660, fig. 53 (off n. coast Cuba; 23°05'30"N, 82°35'W; 604 m; Harvard-Havana Exped. sta. 3305).

Synonyms : None.

FAO Names : En - Slimehead grenadier.



scale top of head underside

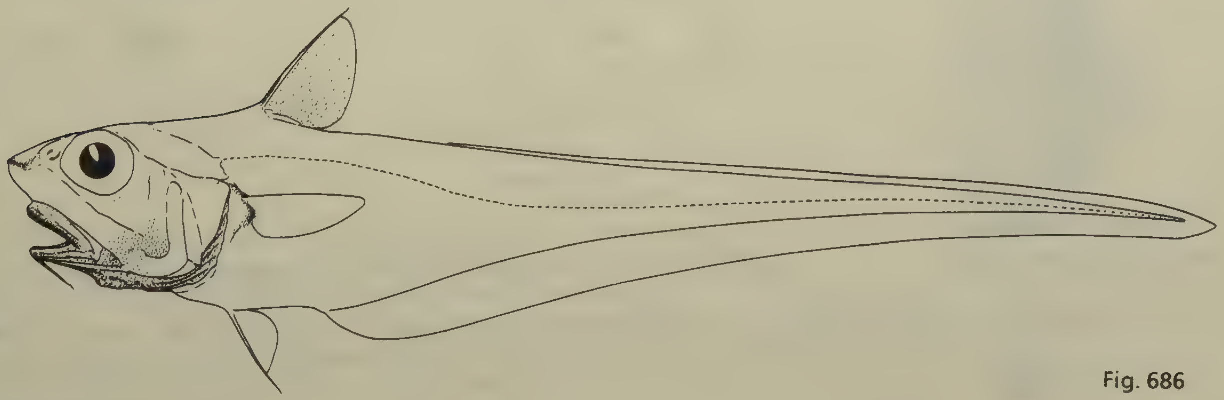


Fig. 686

Diagnostic Features : Teeth in premaxilla in a rather narrow band, outer series slightly enlarged; mandibular teeth in 2 or 3 series, inner teeth slightly larger than outer. Inner gill rakers on first arch 12 to 14 total. First dorsal fin with 2 spines and 10 to 12 rays, second spinous ray finely serrated along leading edge; pectoral fin rays i20 to i22; pelvic fin rays 8 (rarely 9). Measurements in percentages of head length: snout length 25 to 31; preoral length 14 to 20; orbit diameter 30 to 36; interorbital space 24 to 28; length of upper jaw 39 to 45; barbel length 16 to 23; length of outer gill slit 23 to 27; length of pectoral fin 45 to 55. Scale rows below second dorsal fin 6 or 7 (rarely 8); lateral-line scales over a distance equal to predorsal length usually 40 to 45. Scales rather large, covered with slender conical to somewhat lanceolate and flattened spinules in widely divergent V rows or in quincunx order. Snout with black margin along leading edge only; gums all white; first dorsal fin uniformly blackish.

Geographical Distribution : So far known only from the western Caribbean, the Straits of Florida off Cuba, and the Atlantic off northeastern Florida (Fig. 687).

Habitat and Biology : Benthopelagic in 450 to 732 m depth. Reproductive organs of 17 specimens were examined from a large collection made in 732 m depth off Santa Marta, Colombia. Of these, 15 were females with large gonads containing nearly mature eggs.

Size : To at least 40 cm total length.

Interest to Fisheries : Probably occurs incidentally in catches of royal red shrimp, especially in the Caribbean.

Literature : Marshall (1973).

Remarks : In the western Atlantic, ***V. mucocephalus*** is likely to be confused only with ***V. macropogon***, but the two are easily differentiated by characters given in the key and in the Remarks section in the description of ***V. macropogon***.

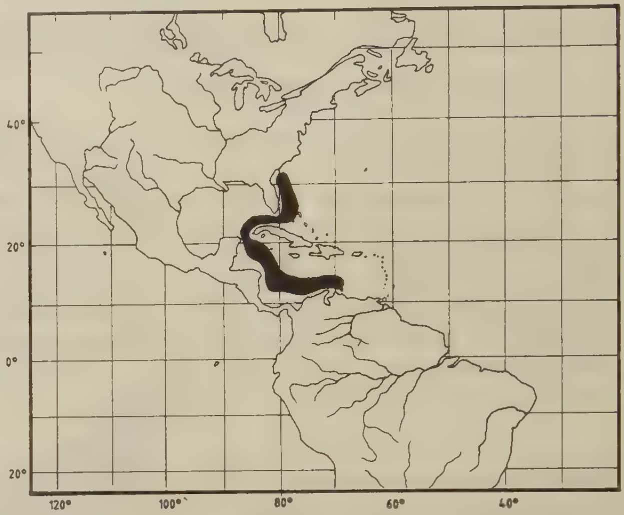


Fig. 687

Ventrifossa nasuta (Smith, 1935)

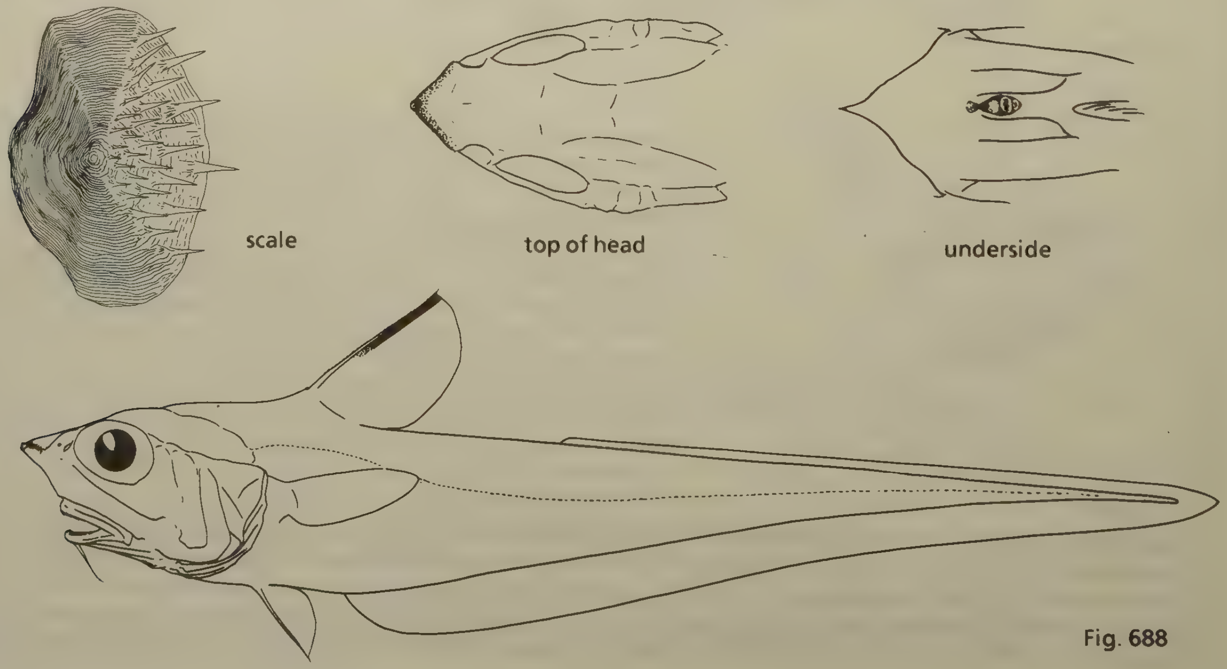
Fig. 688

MACROUR Vent 9

Scientific Name with Reference : ***Lionurus nasutus*** Smith, 1935, Rec. Albany Mus. 4: 176 (South Africa; PICKLE collections, no other data).

Synonyms : ***Macruroplus nasutus*** -- Smith, 1949.

FAO Names : En - Conesnout grenadier.


scale

top of head

underside

Fig. 688

Diagnostic Features : Teeth small, in a narrow band 4 to 6 rows wide in premaxilla, outer series slightly enlarged; mandibular band 4 to 6 teeth wide near symphysis, in 2 or 3 irregular series laterally, the inner teeth slightly larger. Inner gill rakers on first arch 13 to 15 total. First dorsal fin with 2 spines and 9 or 10 (rarely 8 or 11) rays, second spinous ray finely serrated; pectoral fin rays i16 to i22 (usually i18 to i20); pelvic fin rays 8. Measurements in percentages of head length: snout length 28 to 32; preoral length 22 to 25; orbit diameter 33 to 36; interorbital space 27 to 29; distance orbit to angle of preopercle 37 to 42; length of upper jaw 35 to 37; barbel length 18 to 21; length of outer gill slit 19 to 23; length of pectoral fin about 65 to 75. Pyloric caeca 29 to 37. Scales fairly large, covered with conical spinules in quincunx pattern or widely divergent V rows, spinules darkly pigmented except at tip; scale rows below midbase of first dorsal fin 5 to 6.5, below origin of second dorsal fin 5.5 to 7; lateral-line scales over a distance equal to predorsal length 38 to 45. Snout with a black margin along leading edge, the black does not extend onto suborbital or supranarial ridges; first dorsal fin generally dusky except black distally on membrane separating second spinous ray and first branched ray.

Geographical Distribution : Southern Africa (Indian Ocean) and Mozambique (Fig. 689).

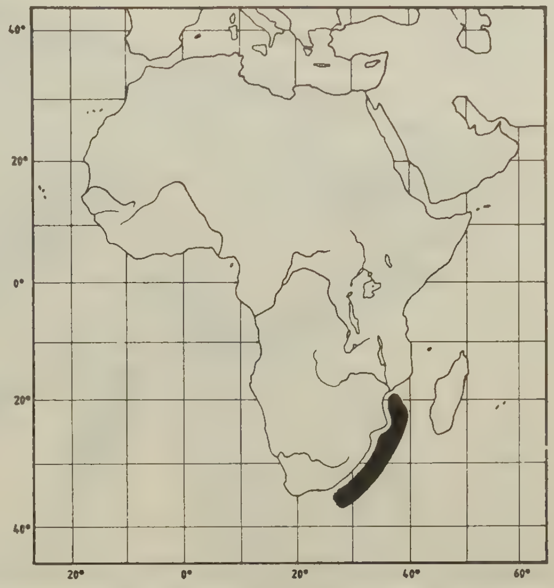


Fig. 689

Habitat and Biology : Benthopelagic in 405 to 960 m depth. Feeds primarily on fish (including ***Bregmaceros***) and squid, but polychaetes and pagurid crabs have also been found in the stomach.

Size : To about 41 cm total length.

Interest to Fisheries : The species has been taken by research vessels in moderate numbers off Mozambique in depths of 450 to 700 m, but no fisheries presumably exists for the species.

Local Names : SOUTH AFRICA : Rattail

Literature : Smith (1935); Iwamoto (in Smith & Heemstra, 1986).

Remarks : ***Ventrifossa nasuta*** bears resemblance to ***V. misakia***, ***V. johnboborum***, and ***V. fusca*** in general shape and presence of a small terminal snout scute, but it differs from these three in having much larger scales, a longer barbel, and a black membrane between the second spinous ray of the first dorsal fin and the first branched ray, among other features.

Ventrifossa nigrodorsalis Gilbert & Hubbs, 1920

Fig. 690

MACROUR Vent 10

Scientific Name with Reference : *Ventrifossa nigrodorsalis* Gilbert & Hubbs, 1920, Bull. U.S. Natl. Mus. 100, 1(7): 546, fig. 36 (Philippines off Mindanao; 8°37'37"N, 124°35'E; 391 m; ALBATROSS sta. 5502).

Synonyms : None

FAO Names : **En** - Spinaker grenadier.

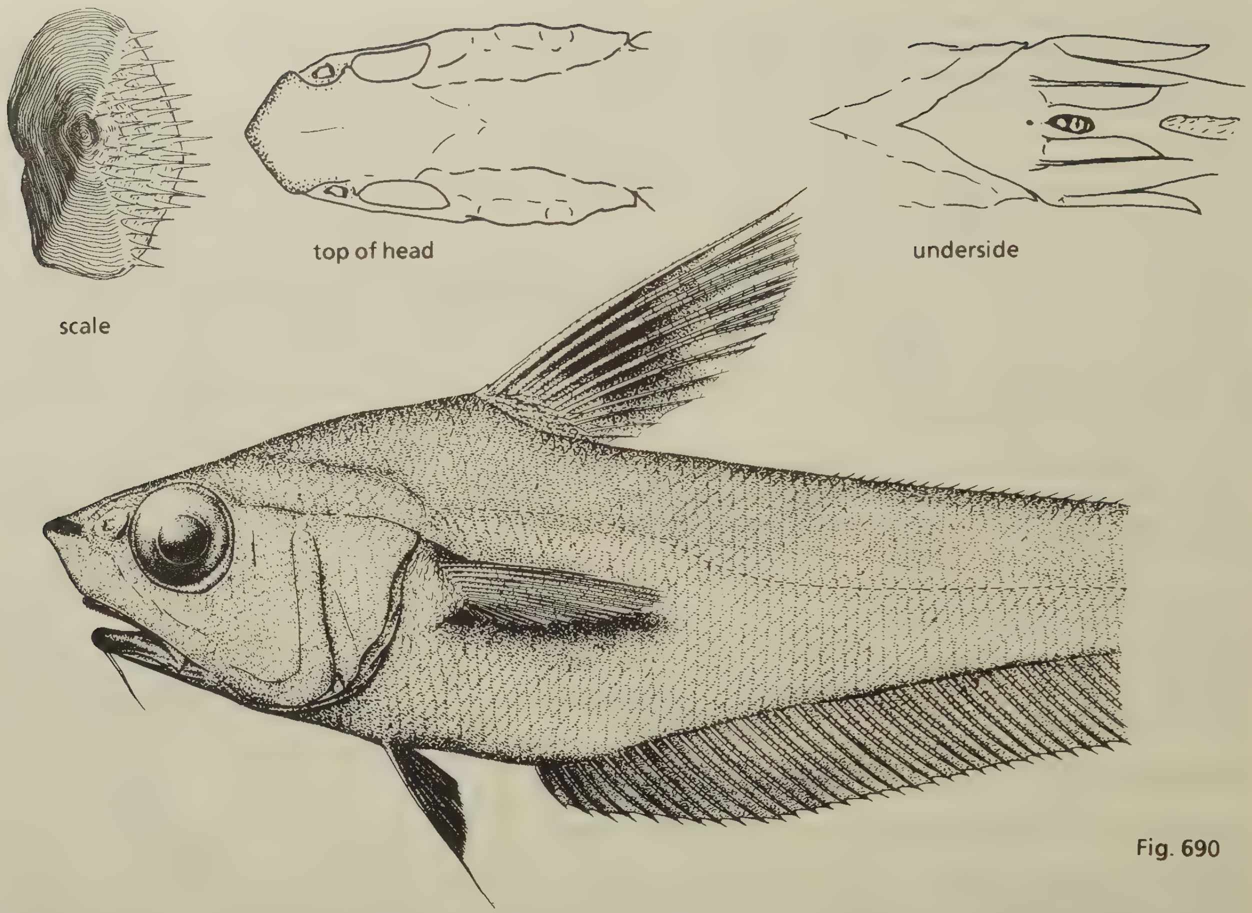


Fig. 690

Diagnostic Features : Teeth small, in broad bands in premaxilla, outer series slightly enlarged; mandibular teeth in a rather narrow tapered band about 3 or 4 teeth wide laterally. Inner gill rakers on first arch 13 to 15 total. First dorsal with 2 spines and 9 or 10 rays, second spinous ray finely serrated; pectoral fin rays i18 to i22 (rarely 23); pelvic fin rays 8 or 9 (usually 8). Measurements in percentages of head length: snout length 26 to 32; preoral length 14 to 21; orbit diameter 29 to 33; interorbital space 21 to 28; distance orbit to angle of preopercle 40 to 45; length of upper jaw 37 to 42; barbel length 18 to 23; length of outer gill slit 20 to 24; body depth under origin of first dorsal 77 to 93; length of pectoral fin 48 to 67. Scales medium-sized, uniformly covered with slender, sharp, conical reclined spinules in widely divergent V rows or quincunx order; scale rows below origin of second dorsal fin 6.5 to 8; lateral-line scales over a distance equal to predorsal length 36 to 43. Snout with a black margin along leading edge, extending posteriorly onto suborbital shelf but not over supranarial and median nasal ridges; first dorsal fin with a large black blotch across middle.

Geographical Distribution : Known from southern Japan, Taiwan Island, Philippines, and parts of Indonesia (Borneo, Halmahera) (Fig. 691). Slight morphological variation seen in specimens from Japan and Indonesia, but not sufficient to recognize additional taxa.

Habitat and Biology : Benthopelagic in 270 to 700 m depth.

Size : To about 34 cm total length.

Interest to Fisheries : An abundant species, especially in the Philippines, but no catch statistics are available.

Local Names : JAPAN : Homaehige.

Literature : Gilbert & Hubbs (1920); Okamura (in Okamura et al., 1982).

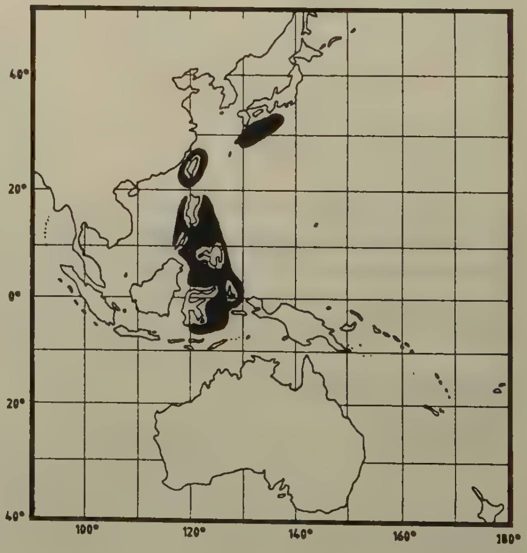


Fig. 691

Remarks : ***Ventrifossa nigrodorsalis*** is closely related to three other species with a black-blotched first dorsal: ***V. petersoni, V. rhipidodorsalis***, and ***V. longebarbata***. ***V. petersoni***, to which it seems closest, differs in its longer barbel (20 to 28% of head length), smaller orbit diameter (25 to 29.5% of head length), shorter preoral length (11 to 14.5% of head length), more extensive areas of spinuleless scales behind first dorsal, blackish spinules, black margin on supranarial ridges and dorsal rim of orbit. ***V. rhipidodorsalis*** apparently has more spinuleless scales behind the first dorsal, an anteriorly black-edged anal fin, somewhat longer barbel (64.3 to 100% of orbit*), 9 or 10 pelvic fin rays,* and a slightly longer upper jaw (41 to 46.4% of head length*). ***V. longebarbata*** has a longer barbel (102 to 127% of orbit), longer upper jaw (41.9 to 46.9% of head length *), and smaller scales (9 or 10* below midbase of first dorsal and origin of second dorsal, about 47 lateral-line scales over a distance equal to predorsal measurement).

Ventrifossa nigromaculata (McCulloch, 1907)

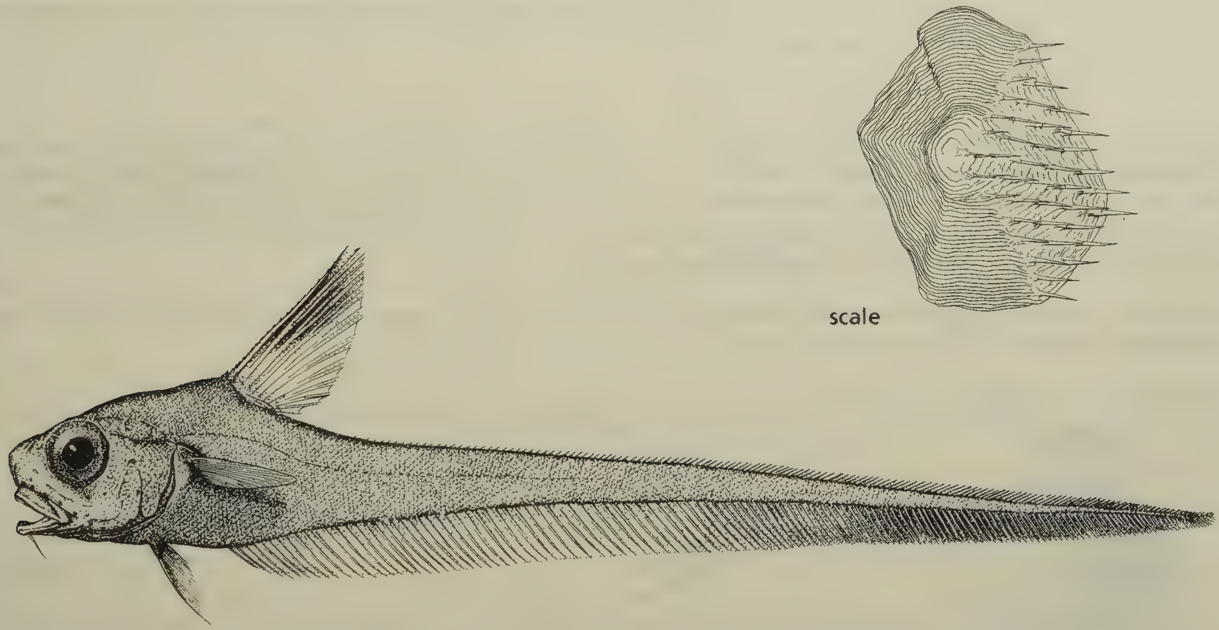
Fig. 692

MACROUR Vent 11

Scientific Name with Reference : ***Macrourus nigromaculatus*** McCulloch, 1907, Rec. Aust. Mus. 6:346, pl. 63, figs. 1, 1a (56 km east of Sydney, Australia; 1463 m).

Synonyms : ***Lionurus nigromaculatus*** -- McCulloch, 1919; ***Nezumia nigromaculata*** -- Makushok, 1967; ***Macruroplus potronus*** Pequeño, 1971; ***Ventrifossa (Lucigadus) nigromaculata*** -- Iwamoto, 1979.

FAO Names : **En** - Blackspotted grenadier.



(after Iwamoto, in Smith & Heemstra, 1986)

Fig. 692

Diagnostic Features : Teeth small, in a rather narrow band in premaxilla, outer series slightly enlarged; mandibular teeth in 1 to 3 irregular rows. Inner gill rakers on first arch 12 to 16 total. First dorsal with 2 spines and 10 or 11 rays, second spinous ray finely serrated; pectoral fin rays i18 to i22; pelvic fin rays 13 to 15. Measurements in percentages of head length: snout length 25 to 30; orbit diameter 40 to 47; preoral length 18 to 22; interorbital space 20 to 26; length of upper jaw 39 to 45; barbel length 18 to 26; length of outer gill slit 23 to 30; greatest body depth 92 to 112; length of pectoral fin 63 to 73. Scales small, covered with slender conical spinules in 11 or 12 subparallel rows (in larger specimens); scales present on lower branchiostegal rays and ventral margin of interopercle; scale rows below origin of second dorsal fin 10 to 12; lateral-line scales over a distance equal to predorsal length 42 to 45. Snout without prominent markings; first dorsal fin with a prominent black blotch across upper anterior half to 2/3.

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* Data from Okamura in Okamura et al. (1982, 1984)

Geographical Distribution : Southern Australia, New Zealand, west coast of Chile (Fig. 693).

Habitat and Biology : Benthopelagic; reported from 200 to 1460 m depth but probably most common in 400 to 800 m.

Size : To about 34 cm total length.

Interest to Fisheries : Occasionally caught by trawlers in Tasmania in 450 to 760 m depth, but no catch statistics are available.

Local Names : AUSTRALIA : Black-spotted whiptail.

Literature : McCulloch (1907); Pequeño (1971); Iwamoto (1979); Last, Scott & Talbot (1983).

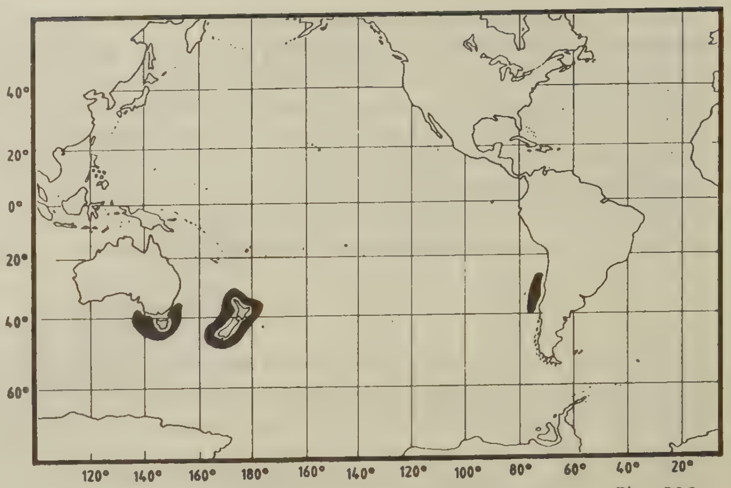


Fig. 693

Remarks : ***Ventrifossa nigromaculata*** is most similar to ***V. ori*** from the South Atlantic, but that species has a somewhat higher range of pelvic ray counts (15 or 16), the black blotch on the first dorsal fin extends to the tip of the first 5 branched rays, the outer gill slit is shorter (18 to 22% of head length), and the ground color is overall swarthy. Other members of this subgenus are readily distinguished by the fewer pelvic fin rays: ***V. lucifer*** (7 or 8); ***V. fasciata*** (10 to 12, and body marked with broad bars and bands); ***V. nigromarginata*** (10 or 11, and anal fin with a black margin anteriorly, scales below second dorsal origin 7 or 8).

Ventrifossa petersoni (Alcock, 1891)

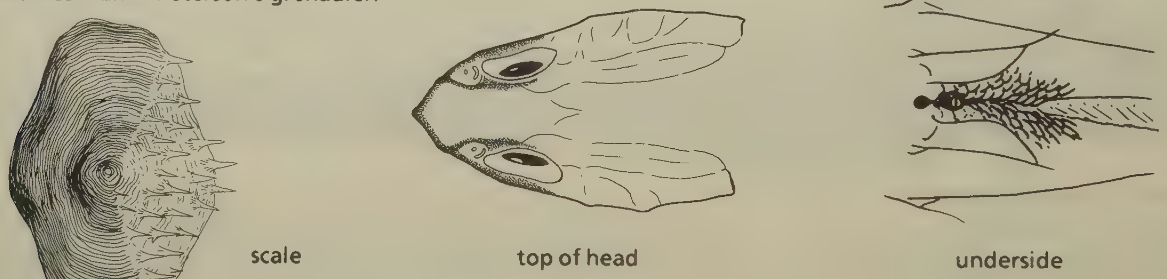
Fig. 694

MACROUR Vent 12

Scientific Name with Reference : ***Macrurus petersonii*** Alcock, in Wood-Mason & Alcock, 1891 (Andaman Sea, 11°31'40"N, 92°46'40"E; 345 to 403 m; INVESTIGATOR sta. 115).

Synonyms : ?***Macrurus (Chalinurus) hispidus*** Alcock, 1889; ***Macrurus (Macrurus) petersonii*** -- Alcock, 1899; ***Ventrifossa petersonii*** -- Gilbert & Hubbs, 1920.

FAO Names : **En** - Peterson's grenadier.



scale

top of head

underside

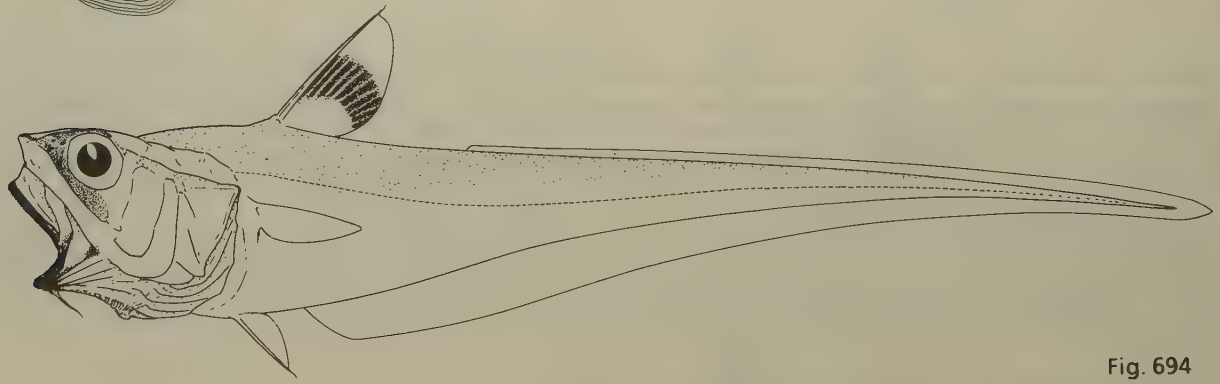


Fig. 694

Diagnostic Features : Teeth small, in a moderate band in premaxillae, outer series slightly enlarged; mandibular teeth in 2 or 3 irregular rows. Inner gill rakers on first arch 14 or 15 total. First dorsal with 2 spines and 8 to 10 rays, second spinous ray finely serrated; pectoral fin rays i21 to i22; pelvic fin rays 8 or 9 (usually 8). Measurements in percentages of head length: snout length 25 to 28; preoral length 11 to 14.5; orbit diameter 25 to 28; interorbital space 22 to 25; orbit to angle of preopercle 40 to 43; upper jaw 39 to 43; barbel length 20 to 28; length of outer gill slit 20 to 26; greatest body depth 78 to 89; length of pectoral fin 43 to 56. Scales rather large, covered with short, slender, conical spinules, many with broadened bases, in widely divergent V rows or quincunx order; scale rows below midbase first dorsal fin 5 to 6.5, below origin of second dorsal fin 6.5 to 7.5; lateral-line scales over a distance equal to predorsal length 38 to 43. Snout with a black margin along leading edge, extending posteriorly onto suborbital shelf, over supranarial ridges, and dorsal rim of orbits; first dorsal with a prominent black blotch across middle to lower portions.

Geographical Distribution : Indian Ocean (Fig. 695).

Habitat and Biology : Benthopelagic; reported from 296 to 1019 m but probably most common in 350 to 700 m depth.

Size : To about 42 cm total length.

Interest to Fisheries : A widespread species in the Indian Ocean, but no catch statistics are available.

Literature : Alcock (in Wood-Mason & Alcock, 1891); Alcock (1899); Brauer (1906); Gilbert & Hubbs (1920); Weber & de Beaufort (1929).

Remarks : ***Ventrifossa petersoni*** is closely related to three other species with a black-blotched first dorsal fin: ***V. nigrodorsalis, V. rhipidodorsalis***, and ***V. longebarbata***. See the description of the first species for comparisons.

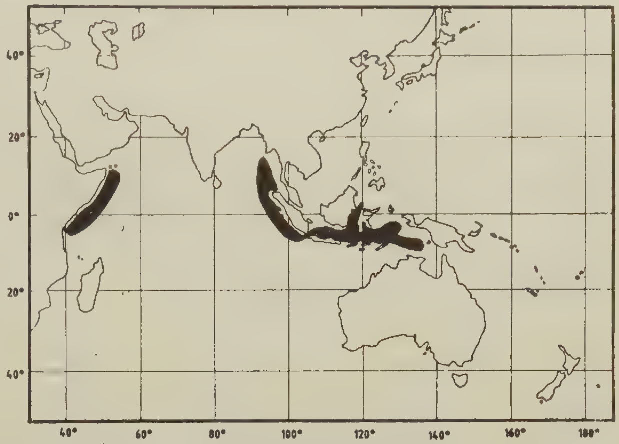


Fig. 695

2.5.1 Subfamily MACROUROIDINAE

Family Macrouroidinae Smith & Radcliffe, 1912, Proc.U.S.Natl.Mus., 43:139

Synonyms : None.

Diagnostic Features : Orbit tiny, about 10% of head length, placed forward of small, inferior mouth; no chin barbel; first gill slit not restricted by membranous folds of skin, outer gill rakers long, slender; branchiostegal rays 7. Anus immediately before anal fin. A single, long, low dorsal fin beginning behind massive swollen head and continuous to end of straplike tail; anal fin long, poorly developed; pelvic fins either rudimentary with 5 rays or absent. No light organ. Swimbladder regressed.

Habitat, Distribution and Biology : The two species in this subfamily are both bentho- to bathypelagic, and widely distributed in temperate and tropical waters of the Pacific, Atlantic, and Indian Oceans. Although most specimens have been captured by bottom trawls, enough representatives have been taken in midwater nets to suggest that the species range vertically over considerable distances (to 5 300 m depth).

Size : To about 40 cm total length.

Interest to Fisheries : None at present.

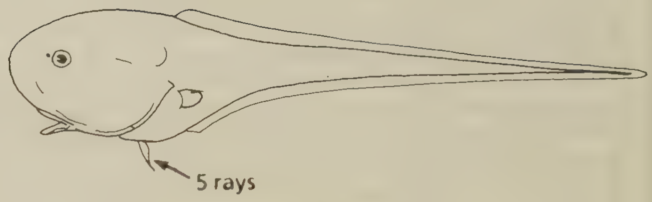
Literature : Smith & Radcliffe in Radcliffe (1912); Gilbert & Hubbs (1916); Okamura (1970a); Marshall (1973).

Remarks : This group has been treated as a separate family by others (see Smith & Radcliffe in Radcliffe, 1912; Okamura, 1970a,b).

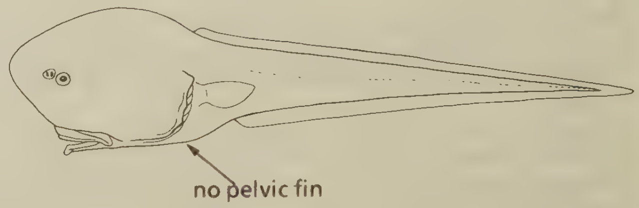
Key to Genera :

1a. Pelvic fin with 5 rays ...... ***Squalogadus modificatus*** Gilbert & Hubbs (1916) (Fig. 696)

1b. Pelvic fins absent .... ***Macrouroides inflaticeps*** Smith & Radcliffe (1912) (Fig. 697)



Squalogadus modificatus Fig. 696



Macrouroides inflaticeps Fig. 697

2.5.2 Subfamily TRACHYRINCINAE

Synonyms : None.

Diagnostic Features : Snout long, pointed, dorsoventrally flattened; mouth inferior but wide, premaxillae with short pedicels, slightly protractile. Barbel short or absent. A prominent fossa in post-temporal region. Small teeth in bands in both jaws. Branchiostegal rays 7. First gill slit unrestricted. Gill rakers on first arch numerous, slender but rather short. Two dorsal fins, the first short (second ray segmented), the second long, beginning immediately behind the first, with rays well developed, better so than those of anal fin. Scales stout, coarsely spinulated, scutelike, or platelike; a row of keeled scutes along dorsal and anal fins. Swimbladder with 2 or 3 retia mirabilia; no drumming muscles. Abdominal vertebrae 14 (not checked for all species). Anus immediately before anal fin. No light organs.

Habitat, Distribution and Biology : Apparently worldwide in temperate waters, although not recorded in the western and central North Pacific; present in tropical eastern Pacific. Benthopelagic in about 400 to 2 500 m depth. The biology of ***Trachyrincus scabrus*** in the Mediterranean has been fairly extensively studied (Motais, 1960), but little is known of other species of the subfamily.

Size : To more than 55 cm total length .

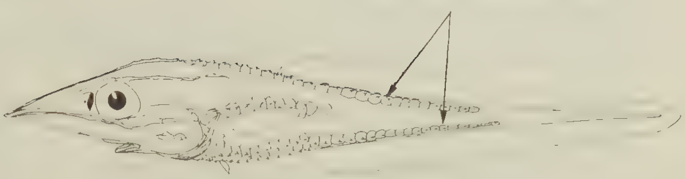
Interest to Fisheries : ***Trachyrincus scabrus*** is apparently fairly common in deep waters of the western Mediterranean, but its economic importance in that region is not known. The other species of the subfamily are too uncommon or found too deep to be of much interest to fishery.

Literature : Günther (1887); Koefoed (1927); Motais (1960); Marshall (1973); Sazonov (1981).

Remarks : Two genera known, one (***Idiolophorhynchus*** Sazonov, 1981) having been described recently from a single species from off New Zealand. Five species of ***Trachyrincus*** are generally recognized.

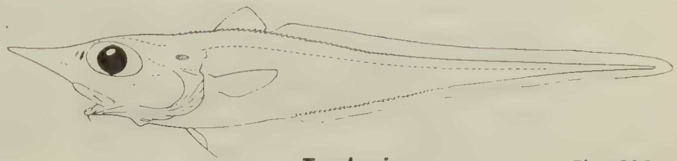
Key to Genera :

1a. Barbel absent. Pelvic fin rays 3 or 4. Body squamation consists of 4 longitudinal rows of large keeled scutes on each side: 1 dorsolaterally, 2 ventrolaterally, and 1 midlaterally, the intervening areas with small scales or naked. Bony ridges of head smooth or weakly spined; head scales weakly or not spinulated (Fig. 698) .... ***Idiolophorhynchus***



Idiolophorhynchus Fig. 698

1b. Barbel small but present. Pelvic fin rays 6 or 7. Body squamation with 2 longitudinal rows of enlarged keeled scutes on each side: 1 dorsolaterally, 1 ventrolaterally, the intervening areas with small coarsely spinulated scales. Bony ridges on head mostly coarsely scaled (Fig. 699) .... ***Trachyrincus***



Trachyrincus Fig. 699

List of Species

Idiolophorhynchus andriashevi Sazonov, 1981
Trachyrincus helolepis Gilbert, 1892
Trachyrincus longirostris Günther, 1878
Trachyrincus murrayi Günther, 1887
Trachyrincus scabrus (Rafinesque, 1810)
Trachyrincus villegai Pequeño, 1971

Trachyrincus Giorna, 1809

MACROUR Trac

Genus with Reference : ***Trachyrincus*** Giorna, 1809, Mem. Acad. Imper. Sci. Turin, (1805-1808): 179 (type species ***Lepidoleprus trachyrincus*** Risso, 1810) (As with another of Giorna's genera [***Coelorinchus***], a question still remains as to the designation of the type species; W. N. Eschmeyer, in a forthcoming book on the genera of fishes, will treat this problem in detail.)

Synonyms : ***Oxycephas*** Rafinesque, 1810; ***Lepidoleprus*** Risso, 1810; ***Lepidosoma*** Swainson, 1839.

Diagnostic Features : As for subfamily, but in addition: barbel small but present; pelvic fin rays 6 or 7; two longitudinal rows of enlarged keeled scutes on each side: 1 dorsolaterally, 1 ventrolaterally, the intervening areas with small coarsely spinulated scales; bony ridges on head mostly coarsely scaled.

Habitat, Distribution and Biology: Mediterranean; North Atlantic from Labrador east to the Irish slope, south to Cape Verde Islands; southeastern Atlantic (Namibia and South Africa); New Zealand area; eastern South Pacific from Panama south to central Chile. Benthopelagic in 403 to 1 978 m depth.

Size : To more than 85 cm total length.

Interest to Fisheries : Only ***T. scabrus*** is of definite interest to fisheries.

Literature : Giorna (1809); Günther (1887); Karrer (1973a, b); Marshall (1973); McCann & McKnight (1980).

Remarks : Often misspelled ***Trachyrhynchus*** and ***Trachyrinchus***; the first following Günther's (1887) unjustified emmendation. The original orthography should be retained.

Key to Species

1a. Scales rather deciduous; none (apparently) on belly .... *T. murray*

1b. Scales adherent; belly fully scaled

  2a. Snout rather short, ventral length about equal to length of premaxillary. Head broad, interorbital width usually greater than orbit diameter. Keels of dorsal and ventral scutes irregularly multidentate at all sizes; none smooth and bladelike (Fig. 700) .... *T. villegai*

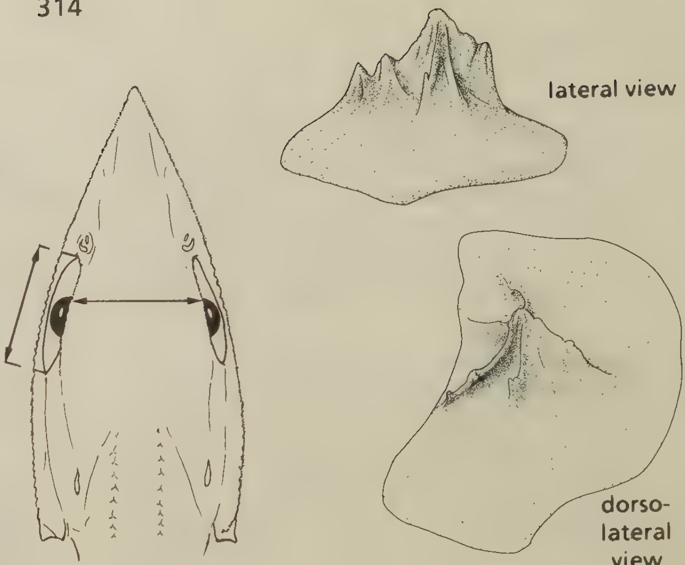
  2b. Snout moderate to long; ventral length about equal to or longer than premaxillary length. Head moderate, interorbital width about equal to or less than orbit diameter. Dorsal and ventral scutes with a single smooth, sharp, recurved, bladelike keel or keels variously multidentate (Figs 701b, 702b)

    3a. Orbit more than 1.7 times into snout, much greater than interorbital width. Scute keels generally smoothly bladelike, without multidentate tips in small individuals (<30 cm), becoming increasingly more multidentate with size (Fig. 701) .... *T. scabrus*

    3b. Orbit about 1.7 times into snout length, about equal to interorbital width. Scute keels smoothly bladelike or almost entirely multidentate at all sizes

      4a. Scute keels almost entirely multidentate at all sizes (Fig. 702) .... *T. helolepis*

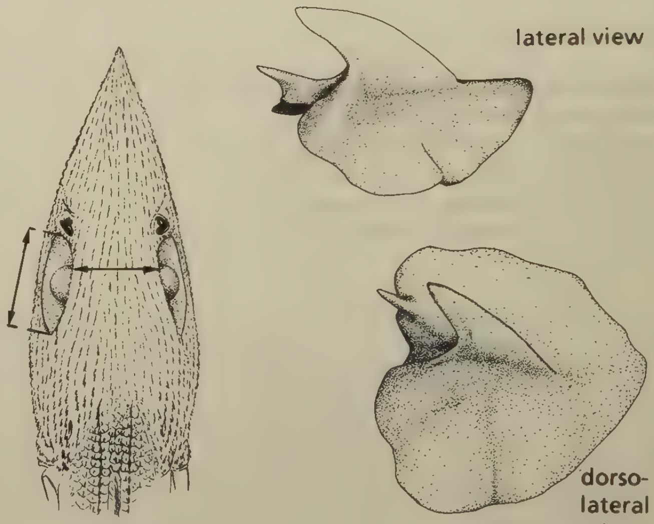
      4b. Scute keels generally smoothly edged blades .... *T. longirostris*



a. top of head

b. dorsal scute

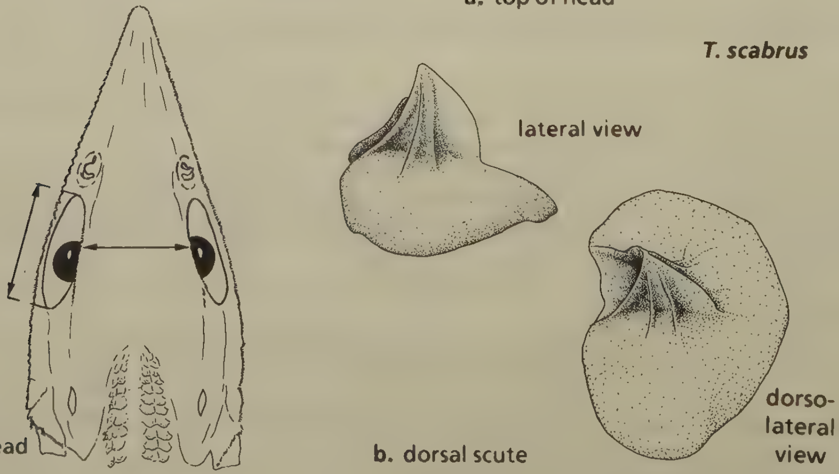
T. villegai Fig. 700



a. top of head

b. dorsal scute

T. scabrus Fig. 701



a. top of head

b. dorsal scute

T. helolepis Fig. 702

Trachyrincus helolepis Gilbert, 1892

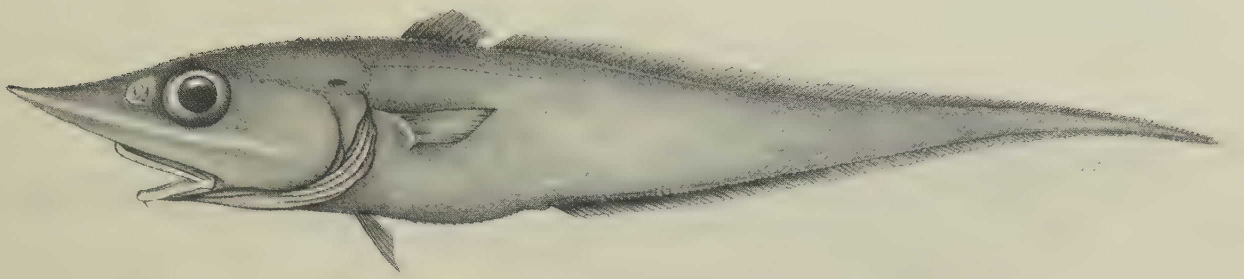
Fig. 703

MACROUR Trac 2

Scientific Name with Reference : ***Trachyrincus helolepis*** Gilbert, 1892, Proc. U.S Natl. Mus., 14:562 to 563 (Galapagos, 0°29'00"S, 89°54'30"W, 717 m).

Synonyms : None.

FAO Names : En - Armourhead grenadier.



(after Garman, 1899)

Fig. 703

Diagnostic Features : Snout rather narrow and long, length 41 to 45% of head length, preoral length 34 to 38%; interorbital space 26 to 32%, about equal to orbit diameter; length of upper jaw 27 to 30%. Outer gill rakers on first arch 21 to 26 total, 16 to 18 on lower limb; outer series on second arch 15 to 17 total. First dorsal fin with 11 to 12 rays; pectoral fin with 21 to 24 rays; pelvic fin with 6 or 7 rays. Row of enlarged scutelike scales along base of anal fin does not extend forward of anus; scutelike scales along dorsal and anal fins usually with a single, sharply pointed keel, if more than one point, the largest point much larger than the others on a scute; scales moderately embedded, the margins well defined; scale rows over distance equal to predorsal length 62 to 65. **Colour**: a uniform medium brown.

Geographical Distribution : Galapagos and Chile (to 32°17'S) (Fig. 704).

Habitat and Biology : Benthopelagic in 580 to 960 m depth.

Size : To at least 46 cm total length.

Interest to Fisheries : Apparently taken occasionally by trawlers off Chile.

Literature : Gilbert (1892); Garman (1899).

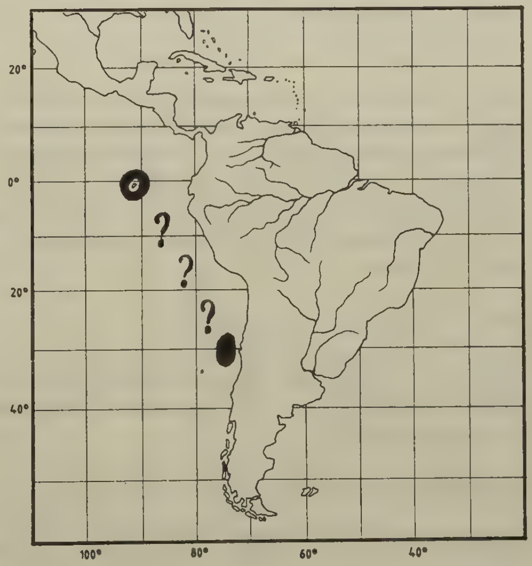


Fig. 704

Trachyrincus scabrus (Rafinesque, 1810)

Fig. 705

MACROUR Trac 1

Scientific Name with Reference : ***Oxycephas scabrus*** Rafinesque, 1810, Indice Ittiol. Sicil.: 13, pl. 1 (fig. 1-2).

Synonyms : *Trachyrincus anonyme* Giorna, 1809; ***Lepidoleprus trachyrincus*** Risso, 1810; ***Trachyrhynchus trachyrhynchus*** -- Günther, 1887; ***Macrurus trachyrhynchus*** -- Vaillant, 1888.

FAO Names : En - Roughsnout grenadier.

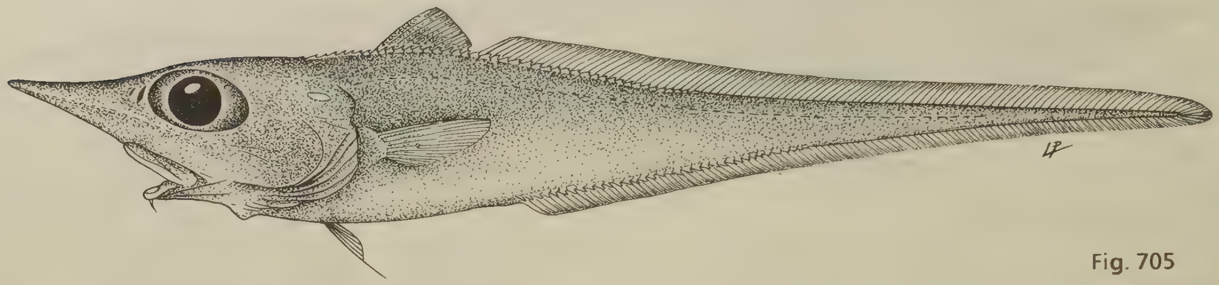


Fig. 705

Diagnostic Features : Dorsal scute row with more than 20 scutes behind vertical through anus; ventral scute row with no scute before anus; scute keels generally smoothly bladelike, without multicuspid tips in small individuals (<30 cm), becoming increasingly more multicuspid with size. Scales adherent; belly fully scaled. Orbit more than 1.7 times into snout length, much greater than interorbital width. Ventral length of snout much greater than length of premaxillary.

Geographical Distribution : Mediterranean and eastern North Atlantic, from Irish slope to Cape Verde Islands (Fig. 706).

Habitat and Biology : Benthopelagic in 395 to 1 495 m depth. Primarily a pelagic feeder. Geistodoerfer (1978a) recorded a predominance of pelagic copepods in the stomachs of specimens taken off northwest Africa, with lesser quantities of mysids, shrimps, cephalopods, and fish. Polychaetes and gastropods composed a minor part of the diet.

Size : To about 50 cm total length.

Interest to Fisheries : Taken as bycatch by offshore bottom trawlers throughout its range. Mostly reduced to fishmeal and oil.

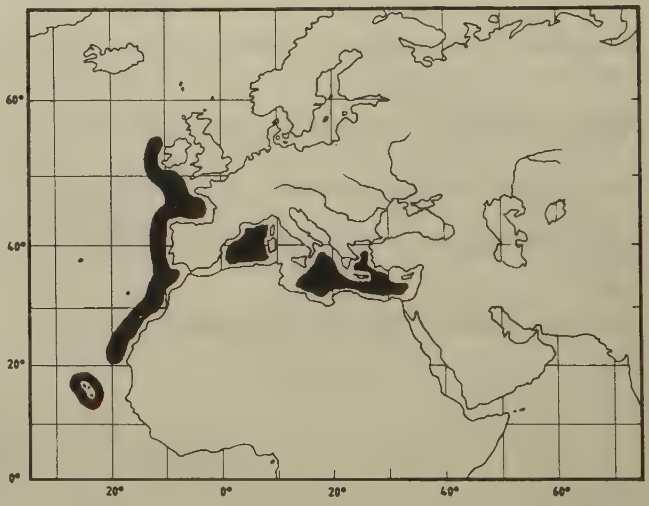


Fig. 706

Local Names : POLAND : Coarse-nosed grenadier.

Literature : Günther (1887); Farran (1924); Koefoed (1927); Marshall (1973); Marshall & Merrett (1977).

Remarks : The name ***Trachyrincus anonyme***, given for the species by Giorna (1809) in his original description of the genus, was not used as a binominal and can thus be ignored. The species name ***scabrus*** Rafinesque, 1810, predates ***trachyrincus*** Risso, 1810, by a few months. The closely related ***T. murrayi*** is generally found further north and west, and extends all the way to the coasts of the Americas off Labrador.

Trachyrincus villegai Pequeño, 1971

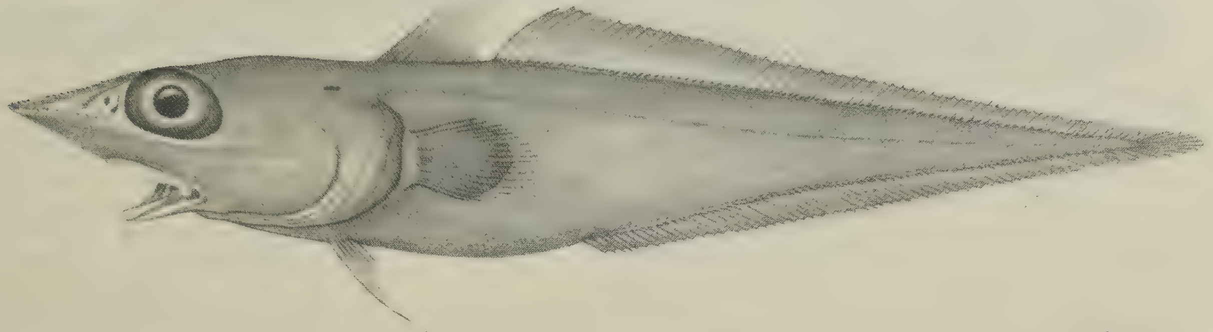
Fig. 707

MACROUR Trac 3

Scientific Name with Reference : ***Trachyrincus villegai*** Pequeño, 1971, Bol. Mus. Nac. Hist. Nat. Chile ,32: 277-279, fig. 4; (Chile, 25°19'00"S, 70°33'05"W, 320-324 m).

Synonyms : None.

FAO Names : En - Grey grenadier.



(after Pequeño, 1971)

Fig. 707

Diagnostic Features : Snout broad in juveniles, becoming narrower and relatively longer in adults, its length 30 to 41% of head length, preoral length 23 to 33% of head length; interorbital space broad, 28 to 36% of head length, about equal to or (usually) more than orbit diameter; length of upper jaw 30 to 35% of head length. First dorsal with 10 or 11 rays; pectoral fin with 19 to 24 rays; pelvic fin with 6 or 7 rays. Row of enlarged scutelike scales along base of anal fin does not extend forward of anus; scutelike scales bluntly pointed and denticulate, the largest point only slightly larger than the others on a scute, scales deeply embedded and covered with thick skin, the margins obscured; scale rows over a distance equal to predorsal length 54 to 59. Outer gill rakers on first arch 21 to 24 total, 16 to 18 on lower limb; outer series on second arch 14 to 16 total. **Colour** greyish.

Geographical Distribution : Northern Peru to central Chile (to at least 30°S) (Fig. 708).

Habitat and Biology : Benthopelagic in 250 to 980 m depth.

Size : To at least 44 cm total length.

Interest to Fisheries : Apparently taken occasionally by trawlers off Peru and Chile.

Literature : Pequeño (1971); Chirichigno (1978).

Remarks : ***Trachyrincus villegai*** is readily distinguished from its only eastern Pacific counterpart, ***T. helolepis***, by its grey to greyish brown colour (cf. uniformly brownish) its broader, blunter snout (viewed dorsally at all stages), and its coarser squamation.

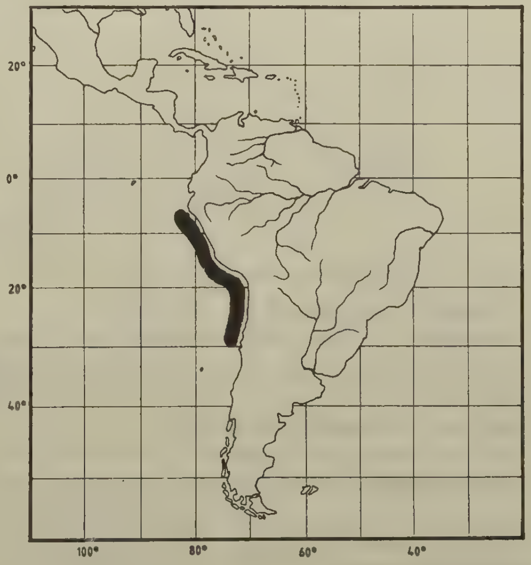


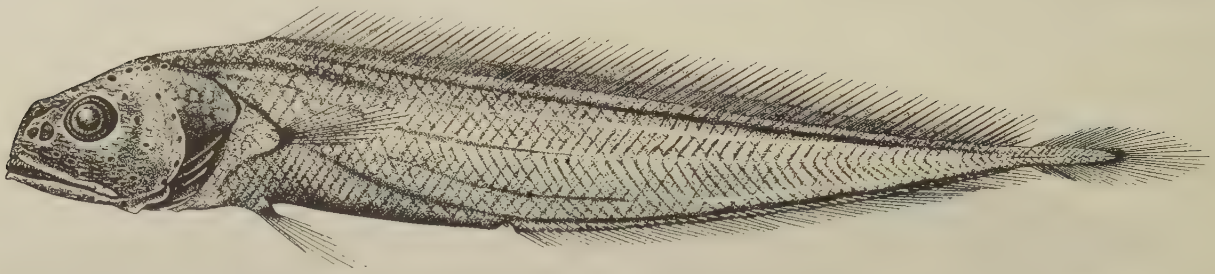
Fig. 708

2.6 FAMILY MELANONIDAE

Fig. 709

MELAN

FAO Names : En - Pelagic cods.



(drawn by K. Moore, Washington)

Melanonus gracilis Fig. 709

General Features : Small fishes, not exceeding 15 cm in total length; body long and tapering. Head blunt, without chin barbel and covered with numerous small, fleshy ridges. A long-based, single dorsal fin, sometimes appearing as two; a single, long-based anal fin; both are separate from, but close to the caudal fin on the slender caudal peduncle. **Colour:** pale to dark.

Habitat, Distribution and Biology : Oceanic, meso- to bathypelagic, widely distributed in subantarctic, temperate and tropical waters.

Interest to Fisheries : None.

Remarks : This family includes a single genus.

Melanonus Günther, 1878

MELAN Melan

Genus with Reference : ***Melanonus*** Günther, 1878, Ann.Mag.Nat.Hist.(5), Vol. 2:19.

Diagnostic Features : See family.

List of Species :

Melanonus gracilis Günther, 1878 (Southern Ocean, circumantarctic, rarely entering temperate waters)
Melanonus zugmayeri Norman, 1930 (Circumglobal in tropical and subtropical seas).

2.7 FAMILY MERLUCCIIDAE

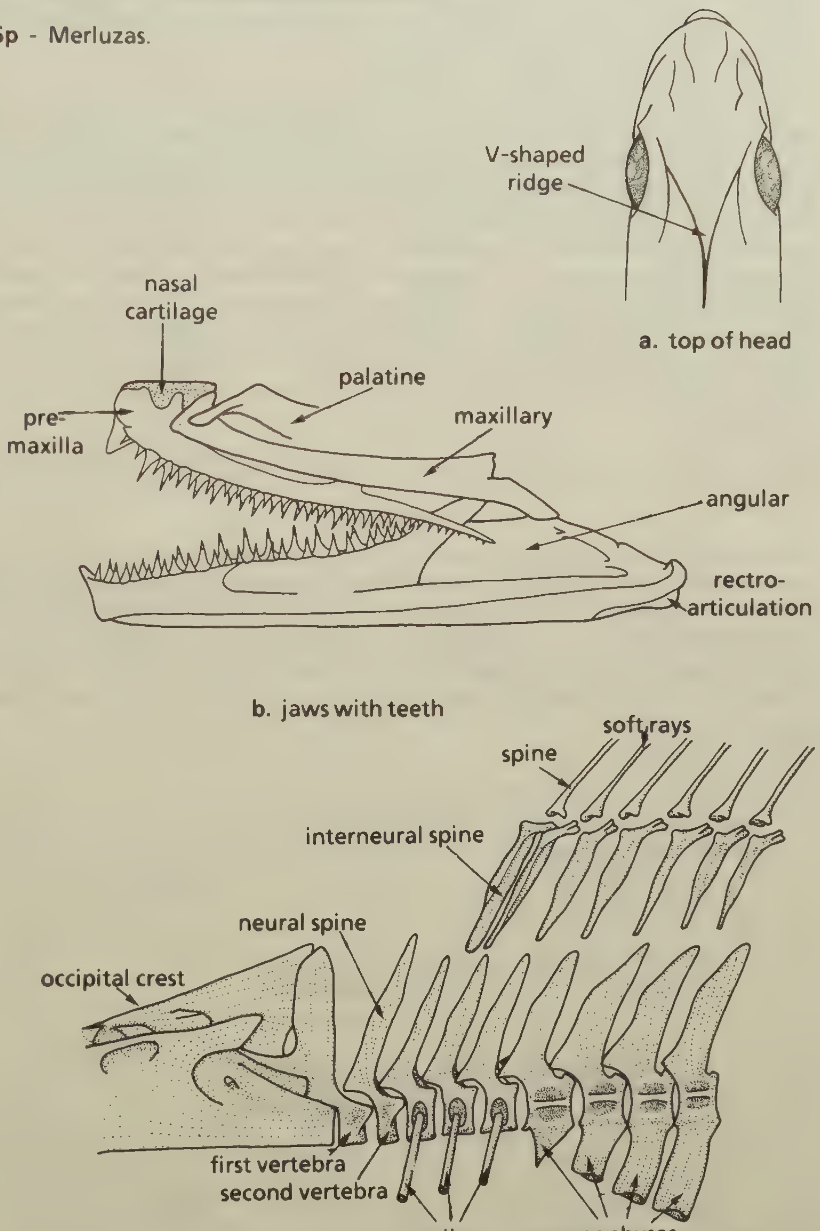
Fig. 710

MERLU

Family Name with Reference : Merlucciidae Gill, 1884, Proc.Acad.Nac.Sci.Phila., 1884:167.

FAO Names : **En** - Hakes; **Fr** - Merlus; **Sp** - Merluzas.

General Features : Body long, slender and laterally compressed. Head large or medium-sized, and little depressed in most species; frontal bones separated, with ridges diverging from the occipital crest and bordering a large triangular depression; a low V-shaped ridge appears on upper side of head; neural spine of first vertebra firmly attached to supra-occipital bone of skull; mouth large, lower jaw slightly projecting beyond the upper in most species, end of upper jaw reaching below middle of eye; eye large, its diameter 1/2 to 1/5 of head length; strong, pointed teeth in jaws in most species; teeth in upper jaw biserial or in a single row; teeth also present on vomer but not on palatines; no barbel on chin; branchiostegal rays 7. Two dorsal and one anal fins; first principal rays spinous in most species; dorsal fin better developed than the anal; pectoral fins rather long and high in position; pelvic fins with 7 to 10 rays and normally developed in most species; caudal fin truncated or tapering. Anus situated close to origin of anal fin in most species. Scales small, cycloid. **Colour:** usually steel grey on back, silvery white on sides and belly; more blackish in some species ***(Merluccius)***, usually light blue on back, silvery white on belly, fins blackish ***(Macruronus)*** and upper parts light brown, belly purplish ***(Steindachneria).***



a. top of head

b. jaws with teeth

c. rear of skull and anterior part of vertebral column

Fig. 710

Habitat, Distribution and Biology : The distribution of the family is illustrated on the map below. The thirteen species of ***Merluccius*** are distributed on both sides of the Atlantic Ocean, in the eastern Pacific Ocean and off southern New Zealand. These fishes inhabit the continental shelf and upper slope, but some enter estuaries and/or very deep waters over 1 000 m depth. They are voracious predators, but their food preferences change during growth. Most undertake diurnal vertical movements and spawn in spring or in summer.

The three species ***Macruronus*** are distributed in Subantarctic waters including southern South America, South Africa, southern Australia and New Zealand. They live in large schools on the continental shelf.

The genus ***Lyconus*** consists of an unknown number of species from the Atlantic (where it apparently has an antitropical distribution) and from the Southwest Pacific.

The genus ***Steindachneria*** is represented by a single species from deep waters of the Gulf of Mexico and the Caribbean.

The biology of the last 3 genera is poorly known at present.

Interest to Fisheries : Most fisheries for merlucciids have developed recently (the hakes having been considered to be trash fish in the past); eleven species of ***Merluccius*** and two species of ***Macruronus*** are now being exploited. Worldwide catches of merlucciids amounted to 1.977 837 t in 1987, which make the Merlucciidae the second-most important family of the Gadiformes (Table II).

As can be seen from the above table, about 30% of the 1987 catches of merlucciid species were taken in the South-West Atlantic (Fishing Area 41) and 23% in the eastern Central Atlantic (Fishing Area 34). The other fishing areas from which catches were reported are, in decreasing order of importance: NE Pacific (67), SE Pacific (87), SW Pacific (81), NW Atlantic (21), NE Atlantic (27), Mediterranean and Black Seas (37), SE Atlantic (47), WC Atlantic (31) and EC Pacific (77). The most important species landed were: ***Merluccius hubbsi*** (22.9% of the world catch), and ***Merluccius capensis*** and ***Merluccius paradoxus*** (combined 22.4%), followed by ***Merluccius productus***, ***Macruronus novaezelandiae***, ***Macruronus magellanicus***, ***Merluccius merluccius***, ***Merluccius polylepis***, ***Merluccius bilinearis***, ***Merluccius gayi***, ***Merluccius senegalensis***, ***Merluccius australis*** and ***Merluccius polli***. It should be noted that ***Merluccius polylepis*** which is considered a synonym of ***Merluccius australis*** by the present author, is treated separately in the FAO statistics. Otter trawls are the main fishing gear in hake fisheries, but traps and pound nets are also used. Hakes are marketed fresh, frozen, chilled as fillets, frozen not as fillets, dried, salted, in brine, canned and as fish meal.

Literature : Svetovidov (1948); Maul (1951); Ginsburg (1954); Franca (1962); Grinols & Tillman (1970); Inada (1981a).

Remarks : Some workers still prefer to recognize the Merlucciidae as a subfamily of the Gadidae, but more recent work suggests that they should be considered as a separate family (Marshall, 1966; Cohen, 1984; Nelson, 1984). The classification adopted in this catalogue follows Cohen (1984), who recognized 4 living genera (2 extinct genera are not mentioned here). In addition to the 3 species of ***Macruronus*** recognized here, two other nominal forms (***M. caninus*** Maul and ***M. maderensis*** Maul) have been wrongly included in this genus. According to D. Cohen, the first is an early life history stage of ***Lyconus***, and the second belongs to the family Macrouridae.

Key to Genera:

1a. Anus and urogenital opening situated close together; luminescent organ absent (subfamily Merlucciinae)

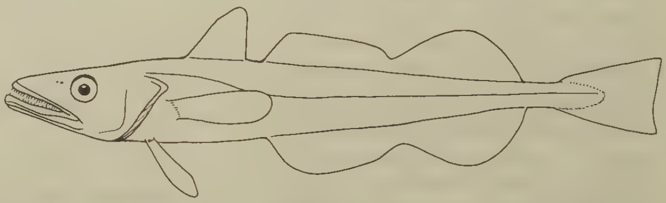
  2a. Two distinct dorsal fins

    3a. A separate caudal fin present .... ***Merluccius*** (Fig. 711)

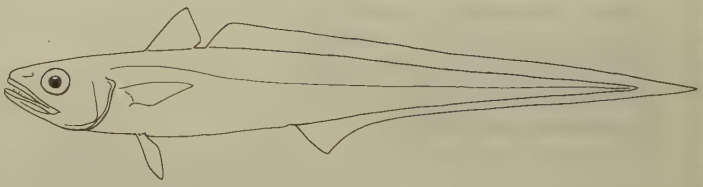
    3b. No separate caudal fin .. ***Macruronus*** (Fig. 712)

  2b. Dorsal fin single .... ***Lyconus*** (Fig. 713)

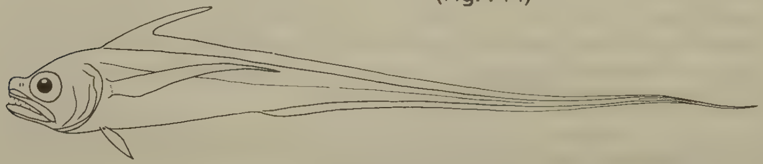
1b. Anus and urogenital opening widely separated; luminescent organ present (subfamily Steindachneriinae) .... ***Steindachneria*** (Fig. 714)



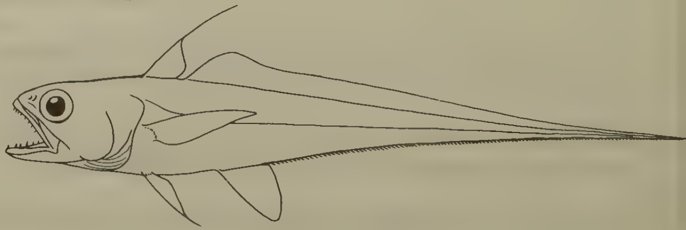
Merluccius Fig. 711



Macruronus Fig. 712



Lyconus Fig. 713



Steindachneria Fig. 714

TABLE II

1987 LANDINGS OF MERLUCCIIDAE IN METRIC TONS REPORTED TO FAO

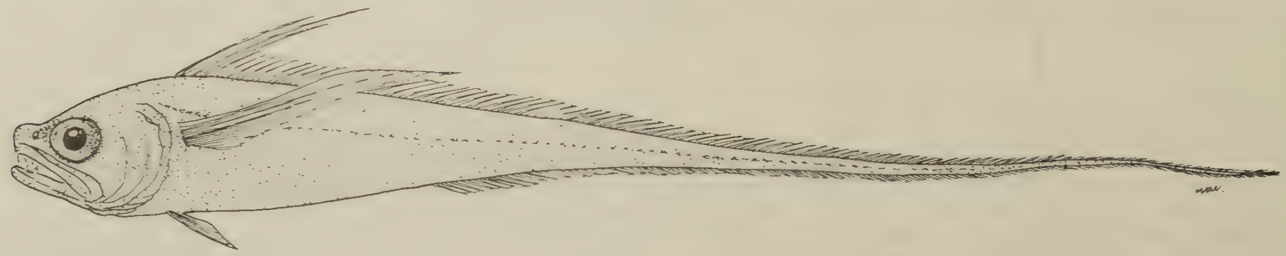
Species	Total	21	27	31	34	37	41	47	67	77	81	87
M. merluccius	116 987		72 455		9 947	34 585						
M. senegalensis	7 469				7 469							
M. australis	3 800										3 800	
M. bilinearis	77 975	77 956		19								
M. gayi	64 286											64 286
M. hubbsi	434 472						434 472					
M. productus	297 976								297 966	10		
M. polli	77							77				
M. polylepis (subpopulation of ***M. australis***)	110 993						54 375					56 618
M. capensis and ***M. paradoxus***	444 348				444 348							
Merluccius spp.	90				71			19				
Macruronus magellanicus	181 005						49 171					131 834
Macruronus novaezelandiae	194 274										194 274	
Macruronus spp.	44 085						44 085					
Total	**1 977 837**	77 956	72 455	19	461 835	34 585	582 103	96	297 966	10	198 074	252 738

Lyconus Günther, 1887

Fig. 715

MERLU Lyco

Genus with Reference : ***Lyconus*** Gunther, 1887:158. Type-species: ***Lyconus pinnatus*** Günther, 1887, by monotypy.



(after Günther, 1887) ***Lyconus pinnatus*** Fig. 715

Diagnostic Features : Body elongate, compressed, with a long, tapering tail lacking a separate caudal fin. Head moderate-sized, about 1/8 of body length, composed of thin bones with narrow mucous channels except in the interorbital space; mouth terminal, large and oblique; end of upper jaw extending beyond middle of orbit; snout short, its tip rounded; eye large, lying immediately below upper profile, its diameter about 1/3 of head length and longer than snout length; interorbital space rather flat and narrower than eye diameter; both jaws armed with a series of widely set teeth, unequal in size, two on tip of upper jaw being canine-like but not as large as the two long lateral fangs of lower jaw; vomer with a single canine-like tooth on each side; no barbel on chin; opercles very thin; infraorbital bone separating maxilla from eye narrow. Dorsal and anal fins long and continuous, composed of very delicate, simple rays; origin of dorsal fin situated above base of pectoral fins; anal fin origin located immediately behind anus, its rays considerably shorter than those of dorsal fin; pectoral fins with 13 rays, directed obliquely upwards and exceedingly elongate, the middle rays extending far beyond anus; pelvic fins thoracic, composed of 10 rays and situated below bases of pectoral fins. Scales very small, thin, cycloid and deciduous.

Interest to Fisheries : None

Literature : Günther (1887); Holt & Byrne (1906); Nelson (1984).

Remarks : A poorly known genus with an unknown number of species. Two, small, rare species have been described so far (Nelson, 1984). One of them, ***Lyconus pinnatus*** Gunther, 1887, was described from a 12.5 cm specimen caught in the middle of the South Atlantic. Gunther noted that there is no break in the continuity of the dorsal fin, but some of its anterior rays are much prolonged; as this portion is injured, no more precise information can be given. The other species, ***Lyconus brachycolus*** Holt & Byrne, 1906 was described from the eastern North Atlantic.

List of species*

Lyconus brachycolus Holt & Byrne, 1906
Lyconus pinnatus Günther, 1887

Macruronus Günther, 1873

MERLU Macru

Genus with Reference : ***Macruronus*** Gunther, 1873:103. Type-species: ***Coryphaenoides novae-zelandiae*** Hector, 1871.

Diagnostic Features : Body elongate, compressed, with a long tapering tail lacking a separate caudal fin. Head moderate-sized, about 1/6 of body length; mouth large and oblique; tip of lower jaw protruding slightly beyond the upper; end of upper jaw extending to below middle of eye; snout long and bluntly pointed, its length 1.3 to 1.5 times the eye diameter; eye large, 1/5 to 1/4 of head length; interorbital space flat, its width almost equal to eye diameter; suborbital ridge absent; teeth in upper jaw biserial or in a single row; those in lower jaw in a single row; several teeth in both jaws long and sharp; small teeth present on vomer, none on palatines; no barbel in chin; gill rakers slender, their length about half of eye diameter; number of gill rakers on lower limb of first arch 11 to 27;

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* Probably includes other species. The genus is being currently revised by D. Cohen

branchiostegal rays 7. First dorsal fin with 8 to 13 rays, high, triangular and short based; second dorsal fin better developed than anal fin with 88 to 120 rays; anal fin with 75 to 105 rays; origin of first dorsal fin slightly behind those of pectoral fins in most species; inner space between dorsal fins very short; origin of second dorsal fin well forward of anal fin origin; anal fin origin slightly forward of mid-point of body; anterior rays of anal fin usually forming a lobe; pectoral fins longer than pelvics in most species, and extending to below first dorsal fin origin; pelvic fins with 8 to 10 rays, situated slightly behind and below pectoral fin origins. Anus just in front of anal fin origin. Scales thin, small and cycloid. **Colour**: dorsal surface silvery with a purple or blue-green tinge; belly silvery, slightly bluish; fins darker, small melanophores scattered on fin membrane of dorsal and anal fins.

Habitat, Distribution and Biology : Distributed in the temperate waters of the southern hemisphere: off Cape Town, South Africa, southern Australia and Tasmania, southern New Zealand, southern Chile and off Argentina. Benthic species, living mainly in the shelf zone, but some seasonally present on the upper slope, in depths from 30 to 650 m; occasionally taken in open sea midwaters. They migrate southward in spring and summer, and northward in winter. Spawning occurs from winter to early spring in deep waters of the continental slope. Young fish are found in shallow waters of the continental shelf One-year-old fish (about 25 cm total length) begin to move to the edge of the shelf and onto the upper continental slope. Sexually maturity is attained at 3 years of age (60 cm fork length). They are fish-eating carnivores feeding exclusively on lantern fishes.

Interest to Fisheries : ***M. novaezelandiae*** and ***M. magellanicus*** are now regularly fished by trawling and became the third-most important merluccid fishery (after ***Merluccius capensis*** and ***paradoxus*** combined, and ***Merluccius hubbsi***) The total catch reported to FAO in 1987 attained 419 364 t for both species (194 274 t and 181 005 t respectively). Of these landings, Chile alone caught 131 834 t.

Literature : Maul (1951); Marshall (1966).

Key to Species:

1a. Total number of gill rakers on first arch 30 to 34 (mode 32) .... ***M. magellanicus***
(Argentina, Chile)

1b. Total number of gill rakers on first arch 27 to 30 (mode 19)

2a. Canine-like teeth on tip of upper jaw present; interorbital width 4.2 to 4.6 times in head length .... ***M. novaezelandiae***
(New Zealand, Tasmania)

2b. Canine-like teeth on tip of upper jaw absent; interorbital width 4.1 to 4.2 times in head length .... ***M. capensis***
(South Africa)

List of species

Macruronus capensis Davies, 1950
Macruronus magellanicus Lönnberg, 1907
Macruronus novazelandiae (Hector, 1871)

Macruronus capensis Davies, 1950

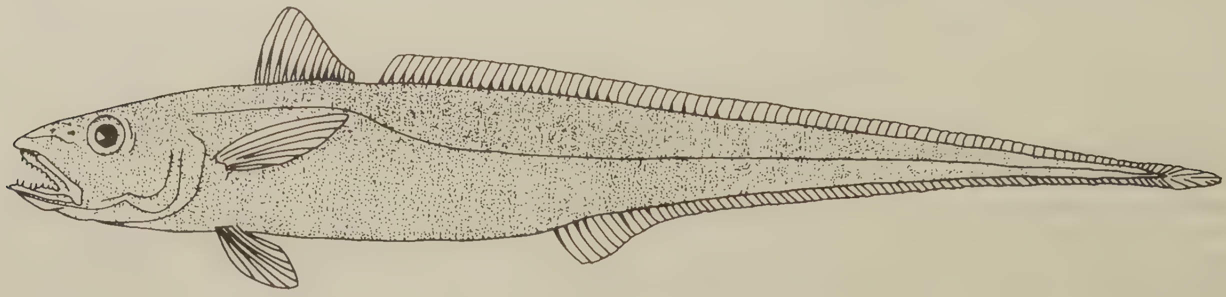
Fig. 716

MERLU Macru 1

Scientific Name with Reference : *Macruronus capensis* Davies, 1950, Ann.Mag.Nat.Hist., 12(3):512.

Synonyms : None

FAO Names : En - Cape grenadier; **Fr** - Grenadier du cap; **Sp** - Grenadero del Cabo.



(after Davies, 1950)

Fig. 716

Diagnostic Features : Body depth 6.3 to 7.2 times in body length; head length about 6 to 6.1 times in total length. Measurements relative to head length: lower jaw 1.5 to 1.9 times; snout 2.9 to 3.3 times; eye diameter 3.8 to 4.6 times; interorbital width 4.1 to 4.2 times. Teeth in both jaws conical, more or less uniform in size, strongly curved and in a single series; 6 to 10 teeth on each side of lower jaw, 12 to 18 on each side of upper jaw; no canine-like teeth on tip of upper jaw; number of gill rakers on first arch, 6 or 7 on upper limb and 21 to 23 on lower limb, 27 to 29 in total. First dorsal fin with 1 spine and 11 to 13 rays; second dorsal with approximately 88 to 98 rays; anal fin with 75 to 102 rays; pectoral fins with 15 to 20 rays, their lengths 1.3 to 1.6 times in head length; pelvic fins with 8 rays, their lengths 1.8 to 2 times in head length. **Colour:** dorsal side of body blackish blue, sides and belly silvery white, all fins blackish.

Geographical Distribution : Off South Africa: in deep waters off the Cape of Good Hope, Mossel Bay and off Algoa Bay (Fig. 717).

Habitat and Biology : Only few individuals have been caught until now. Probably inhabiting very rough bottom or mid-waters.

Size : Recorded maximum length about 1 m.

Interest to Fisheries : None at present.

Local Names : SOUTH AFRICA : Bandstert, Strap-tail.

Literature : Davies (1950); Smith (1965).

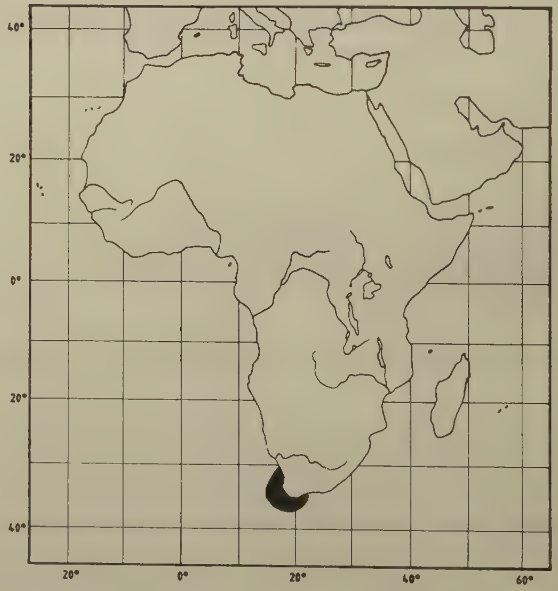


Fig. 717

Macruronus magellanicus Lönnberg, 1907

Fig. 718

MERLU Macru 2

Scientific Name with Reference : ***Macruronus magellanicus*** Lönnberg, 1907, Hamb.Magalh.Sammerlr., Fische:15.

Synonyms : ***Macruronus novae-zelandiae***:Günther, 1880; ***Macruronus argentinae*** Lahille, 1915.

FAO Names : **En** - Patagonian grenadier; **Fr** - Grenadier Patagonien; **Sp** - Merluza de cola.

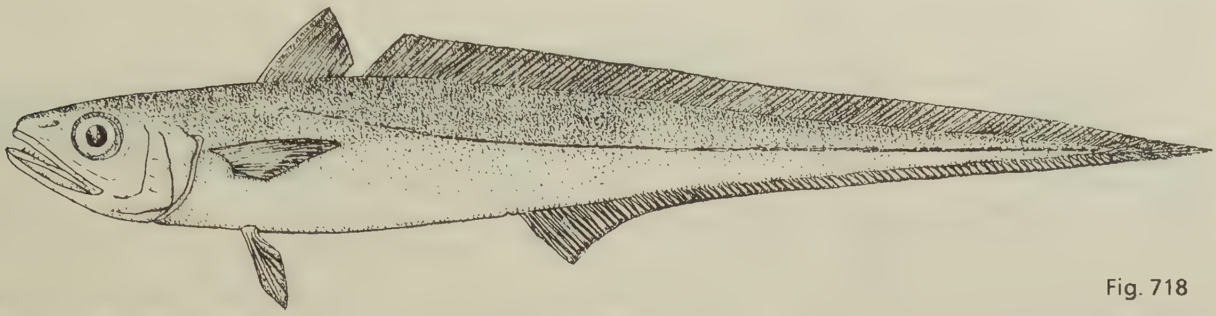


Fig. 718

Diagnostic Features : Body depth 6.7 to 8.1 times in body length; head length 4.75 to 6.6 times in total length. Measurements in relation to head length: interorbital width 4 to 4.8 times; upper jaw 1.7 to 2 times; lower jaw 1.5 to 1.6 times; snout length 3 to 3.3 times; eye diameter 3.2 (young) to 4.4 times. Teeth in lower jaw stronger than those in upper jaw; about 10 conical teeth in upper and 7 to 9 in lower jaw; canine-like teeth on tip of upper jaw present; gill rakers on first arch 7 or 8 on upper limb, 23 to 27 on lower limb, 30 to 34 in total. First dorsal fin with 1 spine and 10 to 13 rays; second dorsal with about 90 to 100 rays; anal fin with 83 to 90 rays; pectoral fins with 17 to 19 rays, their lengths1.3 times in head length; pelvic fins 8 rays, their length 1.6 to 2.1 times in head length. **Colour:** dorsal side of body purplish blue, belly silvery with a slight bluish tinge; small melanophores scattered on fin membrane of dorsal and anal fins, inside of mouth blackish.

Geographical Distribution : Both sides of southern South America. Off Argentina, found on the continental shelf and slope from Buenos Aires to the Straits of Magellan. Off southern Chile, distributed from Chiloé Island to the southern tip of Tierra del Fuego (Fig. 719).

Habitat and Biology : A benthic, schooling species found in depths from 30 to 500 m, concentrated on the outer part of the continental shelf. The Patagonian grenadier migrates southward in spring and summer, and northward in winter. Spawning occurs in winter (June-August), mainly in mid-waters. The main spawning grounds off Argentina are the Gulf of San Matias (south of 48°S), in waters of about 100 m depth. The spawning population includes fishes over 30 cm in preanal length. Feeds mainly on fish (herrings, anchovies, lantern fishes); also on mysids, cephalopods, euphausids and amphipods.

Size : Maximum total length about 1.1 m (5 kg weight); common from 70 to 90 cm.

Interest to Fisheries : Caught mainly off southern Chile. The total catch amounted to 181 005 t in 1987, most being taken by Chile (131 834 t) on the Pacific side, and to Poland (26 685 t) on the Atlantic side. Caught with bottom trawls and utilized fresh, frozen and for fish meal.

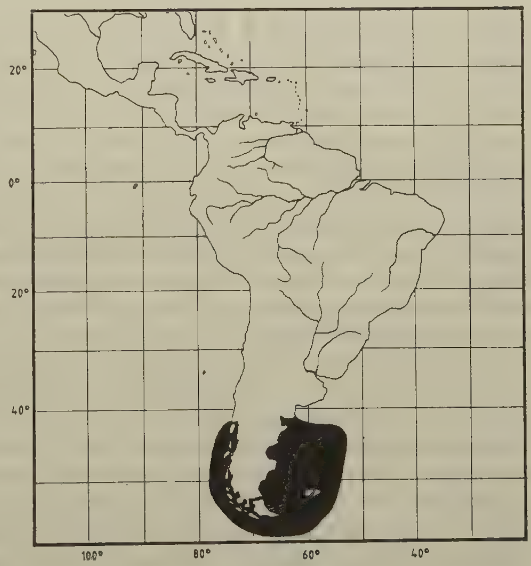


Fig. 719

Local Names : ARGENTINA: Argentino, Merluza de cola; CHILE: Huaiça, Hualca, Huilca, Merluza cola de rata, Merluza de cola.

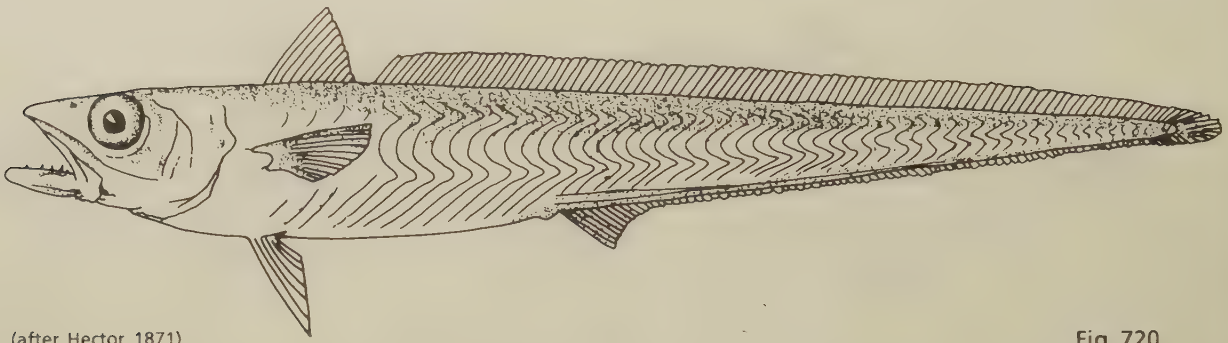
Literature : Lahille (1915); Norman (1937); Hart (1946); Inada (1986).

Macruronus novaezelandiae (Hector, 1871) Fig. 720 **MERLU Macru 3**

Scientific Name with Reference : *Coryphaenoides novae-zelandiae* Hector, 1871, Trans.New Zeal.Inst., 3:136.

Synonyms : None

FAO Names : **En** - Blue grenadier; **Fr** - Grenadier bleu; **Sp** - Cola de rata azul.



(after Hector, 1871)

Fig. 720

Diagnostic Features : Body depth 6.7 to 8.5 times in body length; head length 5.3 to 6.3 times in total length. Measurements in relation to head length: lower jaw 1.5 to 1.6 times; snout 2.2 to 3.2 times; eye diameter 3.5 to 4.6 times; interorbital width 4.2 to 5.1 times. Teeth in upper jaw in two series, the inner with small, regular teeth, the outer with large and sharper teeth; a single series of large teeth in lower jaw; canine-like teeth present at tip of upper jaw. Number of gill rakers on first arch 6 or 7 on upper limb and 21 to 24 on lower limb, 27 to 30 in total. First dorsal fin with 1 spine and 10 to 12 rays; second dorsal with 96 to 102 rays; anal fin with 89 to 95 rays; pectoral fins with 15 to 18 rays, their length 1.3 to 1.5 times in head length; pelvic fins with 8 rays, their length 1.7 to 2.1 times in head length. Scales on lateral line about 182. **Colour:** dorsal surface silvery, with a purple or blue-green tinge; silvery on sides and belly; fins darker.

Geographical Distribution : New Zealand, southern Australia and Tasmania. In New Zealand, most abundant around South Island, Chatham Rise, and Campbell Plateau; uncommon around the North Island. In Australia, found off Tasmania, Victoria, New South Wales, South Australia and southwestern Australia (Fig.721).

Habitat and Biology : A benthic, schooling species found in depths between 450 and 700 m. Juveniles smaller than 40 cm in total length are common in large estuaries and bays, and may even enter freshwaters. Appears to live usually on or near the bottom, but may occasionally move up into mid-waters. Spawning occurs in winter (January to September) on the continental slope. After the planktonic larval phase, the young move to shallow waters over the continental shelf. At the age of one year, they are 24 cm long and begin to move to the edge of the shelf and onto the upper continental slope. Sexual maturity occurs after the third year (at about 60 cm total length). A fish-eating carnivore, even the juveniles feeding predominantly on lantern fishes.

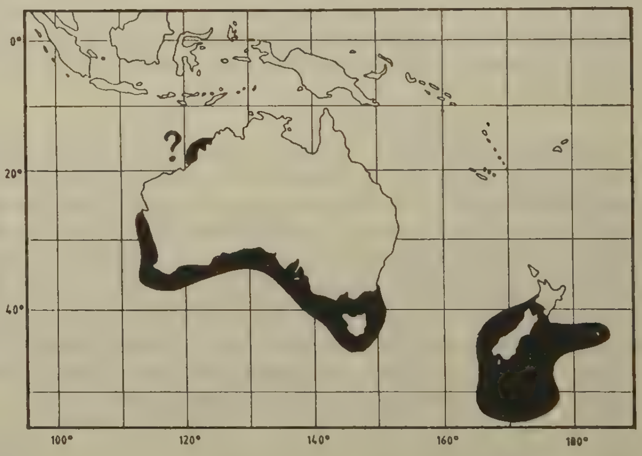


Fig. 721

Size : Maximum length about 1.2 m, common from 60 to 100 cm (1.5 kg weight).

Interest to Fisheries : Caught mainly off New Zealand. The total catch reported to FAO in 1987 amounted to 194 274 t, of which 160 763 t were taken by New Zealand and the remainder by the USSR, Japan and Republic of Korea. It is also caught commercially off Tasmania. Fished mainly by trawling and processed as frozen fillets or blocks; flesh delicate, white, moist and suitable for most methods of cooking.

Local Names : AUSTRALIA: Blue grenadier; GERMANY: Langschwanz-Seehecht; ITALY : Nasello azzurro; JAPAN : Hoki; NEW ZEALAND : Blue hake, Hoki, Whiptail; SPAIN : Merluza azul; USA : New Zealand whiptail.

Literature : Armitage et al. (1981); Ayling & Cox (1982); Last et al. (1983).

Remarks : Some specimens of ***Macruronus*** recently caught off western North Australia (18°S) might represent an undescribed species (N. Sinclair, pers. comm.).

Merluccius Rafinesque, 1810

MERLU Merlu

Genus with Reference : ***Merluccius*** Rafinesque, 1810:25. Type-species; ***Merluccius smiridus*** Rafinesque, 1810 (= ***Gadus merluccius*** Linnaeus, 1758) by monotypy.

Diagnostic Features : Head large, about 1/3 to 1/4 of body length. Mouth large and oblique; maxillary reaching below middle of eye or behind it, almost half the length of head; lower jaw projecting below the upper; snout long and depressed, its length 1.3 to 3.2 times the eye diameter, its tip broad and rounded; eye large, its length 1/2 to 1/5 of upper jaw length; interorbital space broad, slightly elevated, its width 1.0 to 2.4 times the eye diameter; teeth in both jaws well developed, sharp, in two irregular rows; outer teeth fixed; inner ones larger and inwardly depressible; vomer with a biserial row of smaller teeth; no teeth on palatines; gill rakers well developed, varying in shape and number by species. Two separate dorsal fins, the first short, higher and triangular; the second long and partially divided by a notch at midlength; anal fin similar to second dorsal; pectoral fins long, slender and high in position, their relative length becoming smaller with growth; pelvic fins with 7 rays, placed in front of pectorals; caudal fin smaller than head and becoming progressively forked with growth; caudal skeleton possessing a set of X-Y bones. Scales cycloid, thin and small; dorsal surface of head scaled, except anterior tip of snout. Lateral line more or less straight, with 101 to 171 scales. Total number of vertebrae 48 to 58. **Colour :** usually silvery when alive, steel greyish on back, lighter on sides and silvery whitish on belly; some species are more blackish or almost black, with a white-margined caudal fin; iris golden, pupil blue-black.

Geographical Distribution : Hakes are distributed in the waters of both sides of the Atlantic Ocean, the eastern Pacific Ocean and the southern New Zealand waters.

Habitat and Biology : Benthic species living in the shelf zone and the upper slope. In some seasons they enter estuary regions and/or very deep waters over the lower slope. They produce pelagic eggs; the larvae are pelagic and juveniles descend to the bottom in shallow coastal waters. Almost all hakes undertake diel vertical migrations, during which they move away from the seabed at night to feed. They also exhibit seasonal migrations; generally, they move to higher latitudes and into inshore areas in warm seasons (spring to summer) and back to lower latitudes into deeper waters during the cold season (autumn to winter). Males grow slower than females, which live longer than males. Cold-water species grow larger (exceeding 1 m) than do tropical species (to 32 cm) in general. The main spawning season is spring to summer in most species. Hakes are carnivorous in general, but their food preferences change during growth. Juveniles feed on planktonic organisms such as small crustaceans and small fishes. Adults feed chiefly on fishes including small hakes and squids.

Interest to Fisheries : Most hake fisheries have developed recently, and eleven species are now being heavily exploited. Worldwide catches of hakes reported to FAO amounted to 1 558 473 t in 1987. The Argentine hake is now yielding the largest quantities (434 472 t in 1987) and Argentina catches the largest quantity (314 220 t in 1987) in the world. The global standing stock of hakes is not exactly known, but is estimated to be at least 10 million t. Most species are marketed fresh, but some are also reduced to fishmeal. Freezing has also developed recently, especially on board factory ships operating on distant fishing grounds.

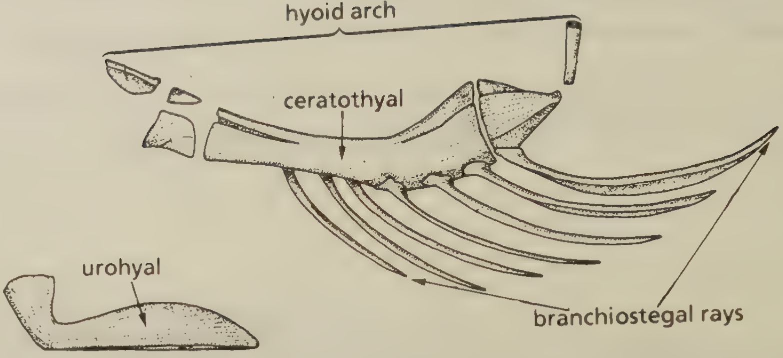
Literature : Svetovidov (1948); Grinols & Tillman (1970); Boerema (1977); Inada (1981a).

Remarks : Mathews (1985) has described a new species of ***Merluccius*** **(*M. hernandezi*)**, the status of which is still under discussion. (See introductory remarks to key to species.)

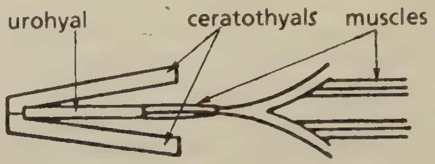
Key to species :

For the identification of the species in this genus, the use of counts (fin rays, scales, gillrakers and vertebrae) is unavoidable. Furthermore, an important diagnostic feature of one species (***M. hubbsi***) is the thickness of the urohyal, a median bone within the heavy muscles lying between the arms of the lower jaw (see Fig. 722)

The recently described ***Merluccius hernandezi*** Mathews, 1985 from the Gulf of California requires further study and can therefore not be included in the present key. It is a small species, similar to ***M. angustimanus***, but differs from it by the caudal fin which has a central lobe in juveniles and is truncate in adults, while it is emarginate in ***M. angustimanus***; the pectoral fin projects well beyond the anus in ***M. hernandezi***, but not so in ***M. angustimanus***.



a. lateral view of hyoid arch and branchiostegals in ***Merluccius*** (urohyal out of place) (from Inada, 1981)



b. diagram of bones and muscles of underside of head showing position of urohyal (from Gosline, 1971)

Fig. 722

Many of the species are entered more than once in the following key.

1a. Total number of gill rakers on first arch fewer than 13

- **2a.** Body blackish, scales along lateral line 102 to 127 .... ***M polli***
  E.C. Atlantic (Fig. 741)

- **2b.** Body silvery

  - **3a.** Scales large; scales along lateral fewer than 120 .... ***M. albidus***
    W.C. Atlantic (Fig. 723)

  - **3b.** Scales small; scales along lateral line more than 119

    - **4a.** Urohyal thickly ossified; combined total number of gill rakers and anal fin rays 49 to 55; scales on lateral line 120 to 142 .... ***M. hubbsi***
      S.W. Atlantic (Fig. 735)

    - **4b.** Urohyal thin, combined total number of gill rakers and anal fin rays 44 to 51; scales on lateral line 127 to 156 .... ***M. merluccius***
      N.E. Atlantic (Fig. 737)

    - **4c.** Urohyal thin, combined total number of gill rakers and anal fin rays 52 to 60; scales on lateral line 144 to 171 .... ***M. australis***
      New Zealand, Patagonia (Fig. 727)

1b. Total number of gill rakers 13 to 15

- **5a.** Urohyal thickly ossified .... ***M. hubbsi***

- **5b.** Urohyal thin

6a. Total number of gill rakers mostly 13 to 16 (range 13 to 18), total number of vertebrae usually 52 to 55 (range 51 to 56); anal fin rays 37 to 40, gill rakers relatively longer .... ***M. senegalensis***
E.C. Atlantic (Fig. 745)

6b. Total number of gill rakers mostly 16 to 20 (range 15 to 20); total number of vertebrae usually 49 to 52 (range 49 to 53); anal fin rays 37 to 41, gill rakers relatively longer .... ***M. capensis***
S.E. Atlantic (Fig. 731)

6c. Total number of gill rakers mostly 12 to 14 (range 11 to 15); total number of vertebrae usually 55 to 57 (range 53 to 58); anal fin rays mostly 41 to 45 (range 40 to 46); gillrakers short .... ***M. australis***

1c. Total number of gill rakers more than 15

7a. Combined total number of gill rakers and anal fin rays fewer than 57

8a. Total number of vertebrae fewer than 53

9a. Total number of gill rakers usually 13 to 16 (range 13 to 18), number of abdominal vertebrae 25 to 28, total number of vertebrae usually 52 to 55 (range 51 to 56)...................... ***M. senegalensis***

9b. Total number of gill rakers 16 to 18, number of abdominal vertebrae 21 to 23, scales on lateral line fewer than 131; maximum size of fish 39 cm .... ***M. angustimanus***
E.C. Pacific (Fig. 725)

9c. Total number of gill rakers usually 16 to 20 (range 15 to 20), total number of vertebrae usually 49 to 52 (range 49 to 53), scales on lateral line more than 131 .... ***M. capensis***

9d. Total number of gill rakers usually 19 to 23 (range 18 to 25), abdominal vertebrae 21 to 24, scales on lateral line fewer than 131 .... ***M. gayi***
S.E. Pacific (Fig. 733)

8b. Total number of vertebrae more than 52

10a. Total number of gill rakers usually 13 to 16 (range 13 to 18), abdominal vertebrae 25 to 28; scales on lateral line more than 123, total number of vertebrae usually 52 to 55 (range 51 to 56) .... ***M. senegalensis***

10b. Total number of gill rakers usually 16 to 20 (range 15 to 20); scales on lateral line more than 131; total number of vertebrae usually 49 to 52 (range 49 to 53) .... ***M. capensis***

10c. Abdominal vertebrae 26 to 29; scales on lateral line fewer than 111 .... ***M. bilinearis***
N.E. Atlantic (Fig. 729)

10d. Abdominal vertebrae 21 to 24; scales on lateral line fewer than 131, total number of gill rakers usually 19 to 23 (range 18 to 25) .... ***M. gayi***

7b. Combined total number of gill rakers and anal fin rays more than 56

11a. Total number of vertebrae fewer than 54

12a. Scales on lateral line fewer than 111; abdominal vertebrae 26 to 29 .... ***M. bilinearis***

12b. Abdominal vertebrae 21 to 24; total number of vertebrae usually 50 to 52 (range 48 to 53); scales on lateral line fewer than 131 .... ***M. gayi***

12c. Scales on lateral line more than 124; abdominal vertebrae 23 to 25; total number of vertebrae 53 or 54 .... ***M. productus***
N.E. Atlantic (Fig. 743)

12d. Scales on lateral line more than 131; total number of vertebrae usually 49 to 52 (range 49 to 53); abdominal vertebrae 23 to 26 .... ***M. capensis***

11b. Total number of vertebrae more than 53

13a. Abdominal vertebrae 26 to 28; scales on lateral line more than 120 .... ***M. paradoxus***
S.E. Atlantic (Fig. 739)

13b. Scales on lateral line fewer than 111; abdominal vertebrae 26 to 29 .... ***M. bilinearis***

13c. Scales on lateral line more than 124; abdominal vertebrae 23 to 25 .... ***M. productus***

List of species:

Merluccius albidus (Mitchill, 1818)
Merluccius angustimanus Garman, 1899
****Merluccius australis*** (Hutton, 1872)
Merluccius bilinearis (Mitchill, 1814)
Merluccius capensis Castelnau, 1861
Merluccius gayi (Guichenot, 1848)
*****Merluccius hernandezi*** Mathews, 1985
Merluccius hubbsi Marini, 1933
Merluccius merluccius (Linnaeus, 1758)
Merluccius paradoxus Franca, 1960
Merluccius polli Cadenat, 1950
Merluccius productus (Ayres, 1855)
Merluccius senegalensis Cadenat, 1950

Merluccius albidus (Mitchill, 1818)

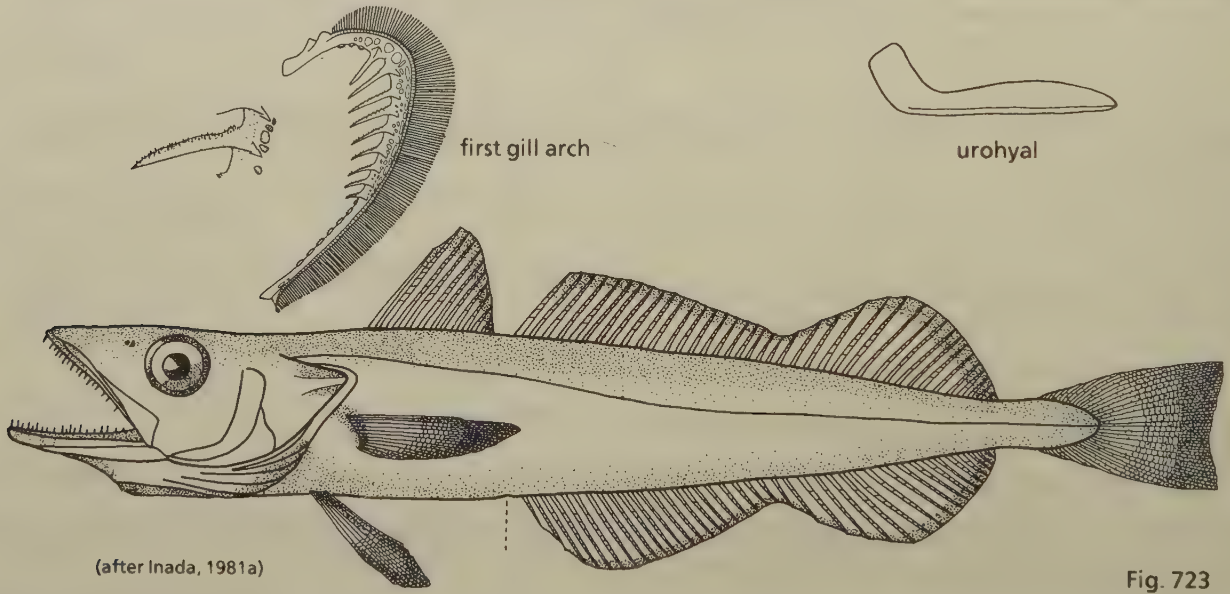
Fig. 723

MERLU Merlu 2

Scientific Name with Reference : ***Gadus albidus*** Mitchill, 1818, J.Acad.Nat.Sci.Philad., 1:409 (New York).

Synonyms : ***Merluccius vulgaris*** (nec Fleming, 1828) Günther, 1862; ***Merluccius bilinearis*** (nec Mitchill, 1814); Norman, 1937; ***Merluccius magnoculus*** Ginsburg, 1954.

FAO Names : **En** - Offshore hake; **Fr** - Merlu argenté du large (de l'Atlantique NO); **Sp** - Merluza blanca de altura.



(after Inada, 1981a)

Fig. 723

Diagnostic Features : Head rather long, 26.8 to 31.7% of standard length. Measurements in relation to head length: eye diameter 15.4 to 22.9%; upper jaw length 48.5 to 55.2%; snout length 31.0 to 37.2%; interorbital width 20.8 to 26.5% . Gill rakers short and thick, with blunt tips; total number on first arch 8 to 11. First dorsal fin with 1 spine and 10 to 12 rays; second dorsal with 35 to 39 rays; anal fin with 35 to 41 rays; tips of pectoral fins reaching origin of anal fin in small fish but not in larger individuals; caudal fin margin truncate (small fish) to concave (larger specimens). Scales rather large, 104 to 119 along lateral line. Total number of vertebrae 51 to 55. **Colour:** silvery white.

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* Includes ***M. polylepis***

** Taxonomic status uncertain

Geographical Distribution : Atlantic coast of USA, Gulf of Mexico and Caribbean Sea; ranges from Georges Bank, New England (40°46'N) to Surinam and French Guiana (5°N) (Fig. 724).

Habitat and Biology : The offshore hake inhabits the outer part of the continental shelf and upper part of the slope (between 80 and 1 170 m depth) and is most abundant between 160 and 640 m. Spawning takes place in summer and occurs near the bottom, in depths between 330 m and 550 m from April to July in New England, and from late spring to early autumn in the Gulf of Mexico and the Caribbean Sea. Fecundity is estimated at 340 000 eggs per female. Feeds at night when it comes up towards the surface. Preys most heavily on fishes (particularly lanternfishes, sardines and anchovies) and, to a lesser extent, crustaceans and squids. Juveniles feed primarily on shrimps.

Size : The largest recorded male and female measured 40 and 70 cm respectively; common to 30 cm (males) and 45 cm (females).

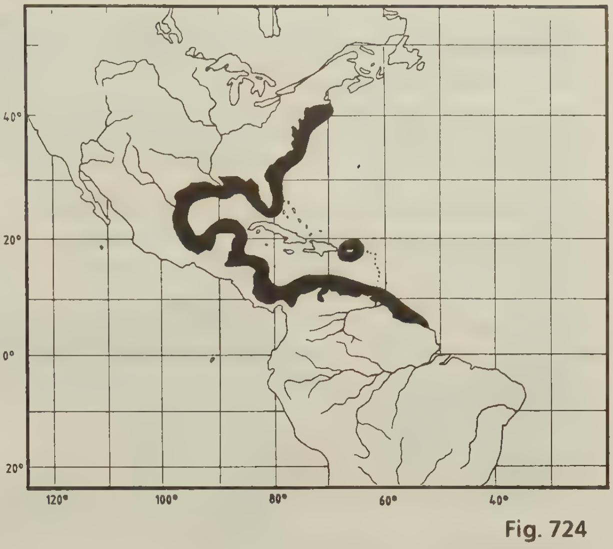


Fig. 724

Interest to Fisheries : The offshore hake is the object of minor local fishing and negligible catch statistics were formerly reported only by Cuba and USA. It does not appear to be a targeted species in the North western Atlantic, where it is taken as bycatch by bottom otter trawls in the silver-hake fishery.

Local Names : FRENCH GUIANA: Merlu; MEXICO, VENEZUELA: Merluza; USA: Offshore silver hake.

Literature : Ginsburg (1954); Rohr & Gutherz (1977); Vergara (1978); Inada (1981a).

Merluccius angustimanus Garman, 1899

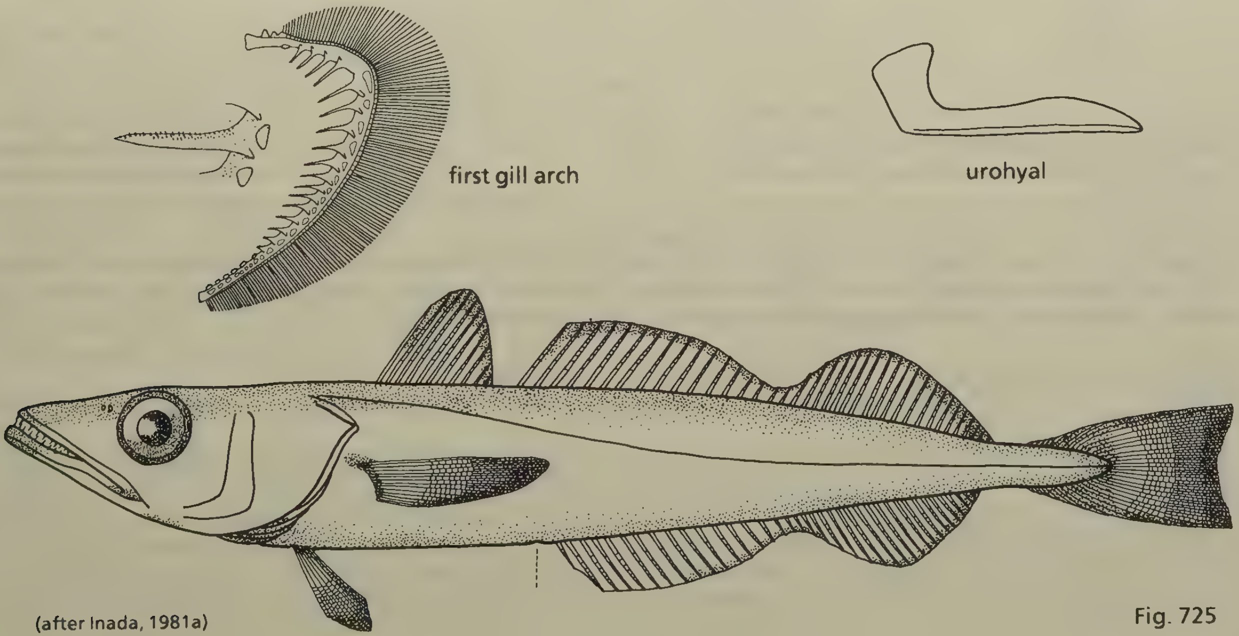
Fig. 725

MERLU Merlu 5

Scientific Name with Reference : ***Merluccius angustimanus*** Garman, 1899, Mem.Mus.Comp. Zool., 24:183 (Gulf of Panama).

Synonyms : ***Merluccius gayi*** (nec Guichenot, 1848,): Norman, 1937; ***Merluccius angusticeps***: Hildebrand, 1946.

FAO Names : **En** - Panama hake; **Fr** - Merlu du Panama; **Sp** - Merluza panameña.



(after Inada, 1981a)

Fig. 725

Diagnostic Features : A relatively small fish usually under 30 cm standard length. Head rather long, 30.1 to 33.5% of standard length. Measurements in relation to head length: upper jaw 44.4 to 48.5%, snout 27.8 to 32.7%; eye diameter 16.0 to 21.2%; gill rakers long and slender, with pointed tips, total number on first arch 16 to 18. First dorsal fin with 1 spine and 9 to 12 rays; second dorsal fin with 36 to 40 rays; anal fin with 36 to 39 rays; pectoral fins long, their tips always reaching to or beyond origin of anal fin; caudal fin margin truncate or concave. Scales along lateral line 121 to 134. Total number of vertebrae 49 to 52. **Colour:** silvery on back, whitish on belly.

Geographical Distribution : Off the west coast of the Americas from Del Mar, California (33°N) to Ensenada de Tumaco, Colombia (2°N) (Fig. 726).

Habitat and Biology : The Panama hake occurs from the shallow continental shelf (80 m) to the upper continental slope (500 m), and in the mid-waters of the open sea and on sea-mounts (Uncle Sam Bank). The spawning season extends from April to June or later. Length at first maturity is 18 to 19 cm for both sexes.

Size : Maximum recorded length 40 cm; common to 32 cm.

Interest to Fisheries : This hake is only exploited locally with trawls, because of its small size and apparently low abundance.

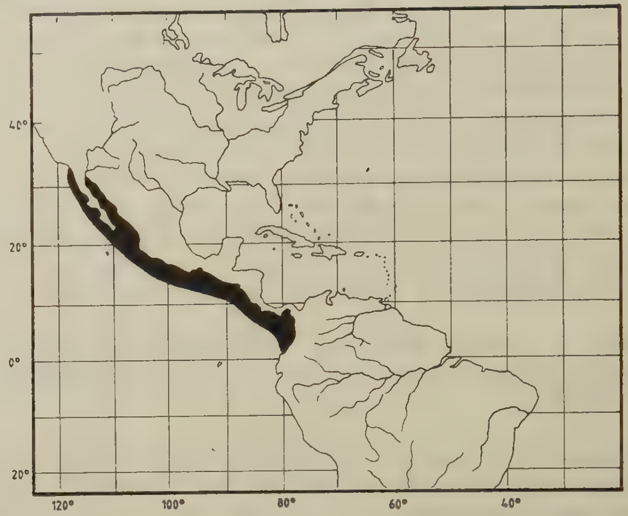


Fig. 726

Local Names : COLUMBIA, MEXICO, PANAMA : Merluza; USA: Dwarf hake.

Literature : Ginsburg (1954); Mathews (1975); Inada (1981a).

Remarks : The dwarf hake off the coast of Baja California reported by Vrooman & Paloma (1970) has been described recently as a different species, ***M. hernandezi*** Mathews, 1985.

Merluccius australis (Hutton, 1872)

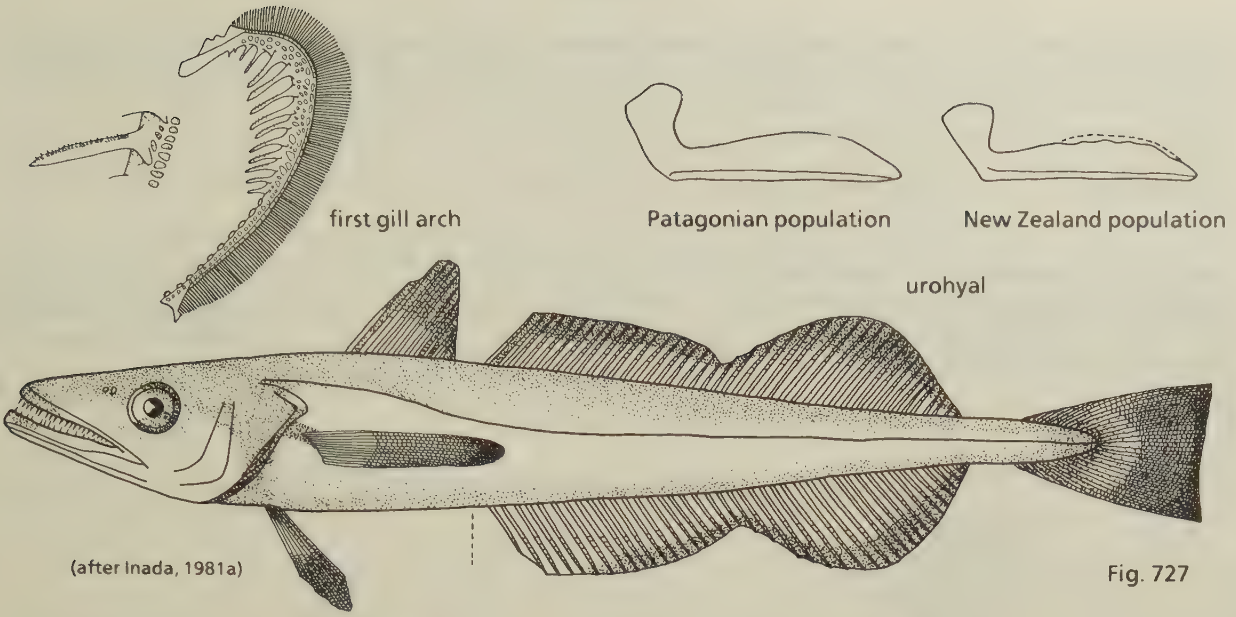
Fig. 727

MERLU Merlu 6

Scientific Name with Reference : ***Gadus australis*** Hutton, 1872, Fish.New Zeal.:45 (Cook Strait of New Zealand).

Synonyms : **Merluccius gayi** (nec Guichenot, 1848): Günther, 1880; ***Merlangius (Huttonichthys) australis*** Whitley, 1937; ***Merluccius polylepis*** Ginsburg, 1954; ***Merluccius gayi australis*:**Mann, 1954; ***Merluccius gayi hubbsi*** (nec Marini, 1933): Mann, 1954; ***Merluccius gayi polylepis*:** Angelescu et al., 1958.

FAO Names : **En** - Southern hake; **Fr** - Merlu austral; **Sp** - Merluza austral.



(after Inada, 1981a)

Fig. 727

Diagnostic Features : Body more slender than that of other hakes. Head short, 24.9 to 28.3% of standard length. Measurements in relation to head length: snout 33.2 to 39.0%; interorbital space 24.7 to 30.4%; upper jaw 48.2 to 55.9%; gill rakers short and thick with blunt tips, total number on first arch 11 to 15 (mostly 12 to 14). First dorsal fin with 1 spine and 9 to 12 rays; second dorsal fin with 39 to 45 rays; anal fin with 40 to 46 rays; pectoral fins long and slender, but their tips not reaching origin of anal fin in fishes larger than 50 cm standard length; caudal fin margin usually truncate, but sometimes convex in small fishes. Scales small, 144 to 171 along lateral line. Total number of vertebrae 53 to 58. **Colour:** steel grey on back, lighter on sides and silvery white on belly.

Geographical Distribution : Two distinct geographical populations are recognized, one from New Zealand (New Zealand population) and the other from southern South America (Patagonian population). The New Zealand population occurs around Chatham Rise, Campbell Plateau and South Island northward to the East Cape. The Patagonian population extends from 40°S (Chiloe Island) in the Pacific, southward around the southern tip of South America, to the continental shelf north to 49°S and the slope north to 38°S in the Atlantic (Fig. 728).

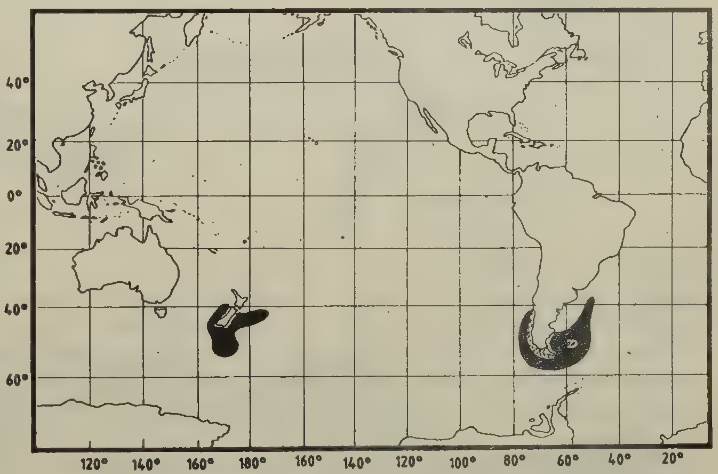


Fig. 728

Habitat and Biology : Found in depths between 415 and 1 000 m (bottom temperatures of 5.8 to 8.0°C) in New Zealand waters, and 62 to 800 m (bottom temperatures 3.8 to 9.0°C) in South American waters. The adults probably migrate southward during the southern summer for feeding, and return to the north in winter for spawning. Off the Patagonian shelf south of 47°S, spawning extends from May to August. First maturity is reached around 65 cm length for males and 85 cm for females. The ratio of females is much higher than that of males. Adults feed on southern blue whiting, whiptail, nototheniids and squids. The New Zealand population spawns from July to August off the west coast of South Island at depths between 800 and 1 000 m, and feeds mainly on fishes (especially gadoids), squids, euphausiids and benthic organisms.

Size : Maximum recorded length: 126 cm; common from 60 to 100 cm in both populations.

Interest to Fisheries : The two populations of this species are reported separately under different species names (***M. polylepis***) for the Patagonian population in the FAO Yearbook of Fisheries Statistics. The New Zealand population is exploited at present (3 800 metric tons in 1987), but its biomass has been estimated at 64 000 t. The Patagonian population has been fished for the last 25 years, especially by Argentina and Chile (110 993 t in 1987). The standing stock of the Patagonian population is estimated at 115 to 127.400 t between 40°S and 57°S off the southern Chile and between 670 and 210 000 t off Argentina. Caught with trawls and marketed fresh, frozen, and as fishmeal.

Local Names : ARGENTINA, CHILE: Maltona, Merluza austral, Merluza del sur, Merluza española, Pescada de los canales; NEW ZEALAND : Haddock, Hake.

Literature : Norman (1937); Inada (1981a).

Merluccius bilinearis (Mitchill, 1814)

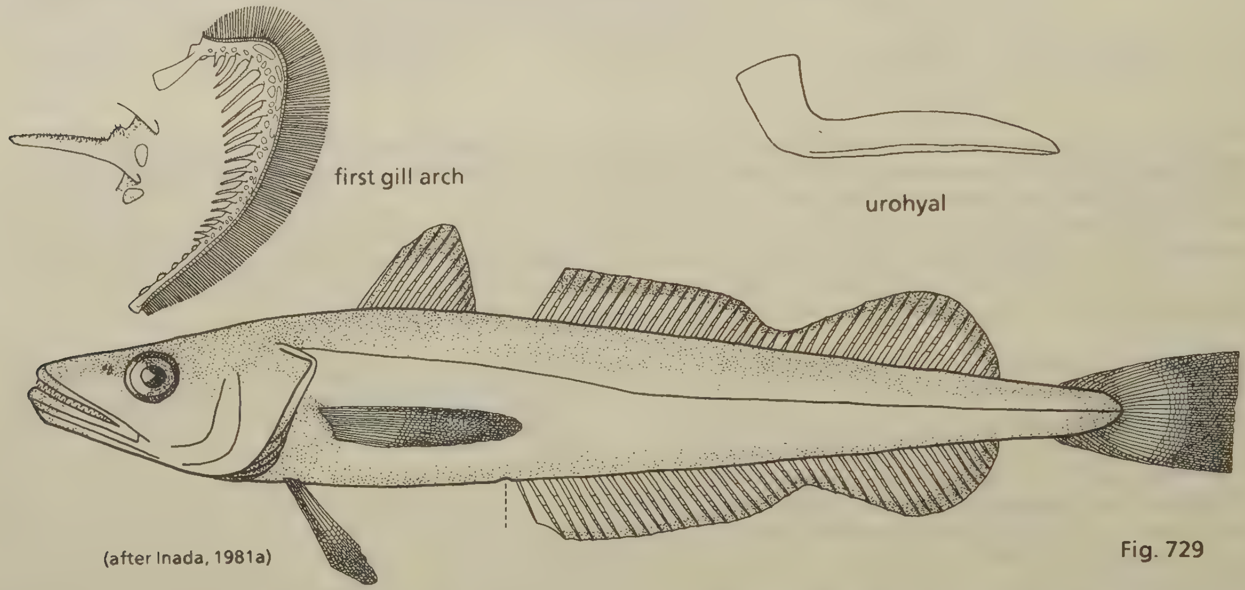
Fig. 729

MERLU Merlu 7

Scientific Name with Reference : ***Stomodon bilinearis*** Mitchill, 1814, Trans.Lit.Phil.Soc., I:7 New York).

Synonyms : ***Merluccius vulgaris*** (nec Fleming, 1828):Günther, 1862.

FAO Names : **En** - Silver hake; **Fr** - Merlu argenté; **Sp** - Merluza Norteamericana.



(after Inada, 1981a)

Fig. 729

Diagnostic Features : Head rather short, 24.4 to 27.4% of standard length. Measurements in relation to head length: upper jaw 50.0 to 54.4%; snout 31.2 to 35.1%; interorbital width 24.0 to 29.8%; gill rakers long and slender, total number on first arch 16 to 20. First dorsal fin with 1 spine and 10 to 12 rays; second dorsal with 37 to 42 rays; anal fin with 37 to 42 rays; tips of pectoral fins reaching origin of anal fin in young fishes; caudal fin margin truncate in smaller fishes but slightly concave in larger individuals. Scales rather large, 101 to 110 along lateral line. Number of vertebrae 26 to 29 (precaudal) + 27 to 29 (caudal) = 53 to 57 (total). **Colour:** silvery white.

Geographical Distribution : Atlantic coast of Canada and USA from Bell Isle Channel (52°N) to the Bahamas (24°N), most common from southern Newfoundland to South Carolina (Fig. 730).

Habitat and Biology : Abundant on the continental shelf in depths from 55 m to 300 m on sandy grounds but can be found up to 914 m depth; sometimes strays into shallower waters. Females grow faster than males; intensive spawning occurs from June to July on the southeastern and southern slopes of Georges Bank, from June to September on the Scotian shelf, and from August to September off Sable Island Bank. Spawning appears to be strongly influenced by water temperature, and annual variations occur both in the peak and the range of the spawning period, which may influence considerably the growth of juveniles. This hake exhibits a seasonal onshore-offshore migration: spawning adults and feeding juveniles move inshore during spring and, when

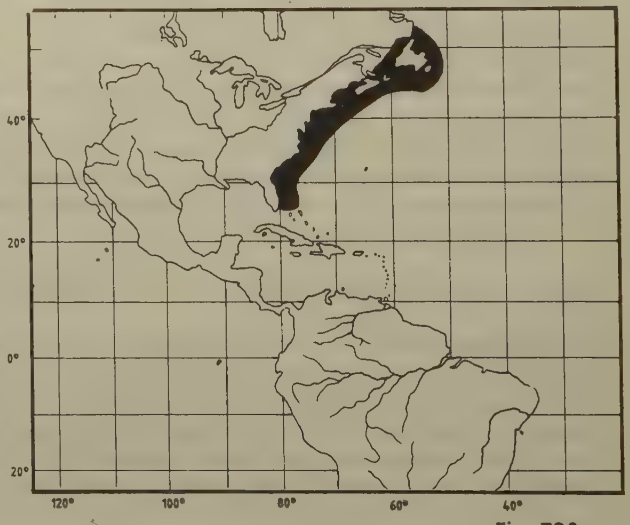


Fig. 730

winter cooling occurs on the shelf, they migrate to warmer waters on the continental edge and slope. Growth is rapid; maximum age is about 12 years. A voracious predator with cannibalistic habits: individuals over 40 cm total length prey on fishes such as gadoids and herring, while smaller ones feed on crustaceans, i.e. euphausiids and pandalids.

Size : Maximum recorded length 76 cm (2.3 kg weight); common: 37 and 65 cm for males and females respectively.

Interest to Fisheries : The total catch reported to FAO in 1987 amounted to 77 975 metric tons (435 000 t in 1973); of which 41 329 were taken by the USSR (an important constituents of their fisheries since 1962), 20 277 t by Cuba, and 15 714 by the USA. The main fishery for this hake takes place off the coast of Nova Scotia, in the Gulf of Maine and on the Georges Bank in depths up to 220 m. The estimated catch potential of this hake in the Northwest Atlantic is estimated to be 350 000 to 500 000 t. The flesh is firm-textured and very tasty. Marketed filleted, frozen, hot-smoked and boiled, and fried.

Local Names : USA: Silver hake.

Literature : Leim & Scott (1966); Grinols & Tillman (1970); Hunt (1980); Inada (1981a);

Merluccius capensis Castelnau, 1861

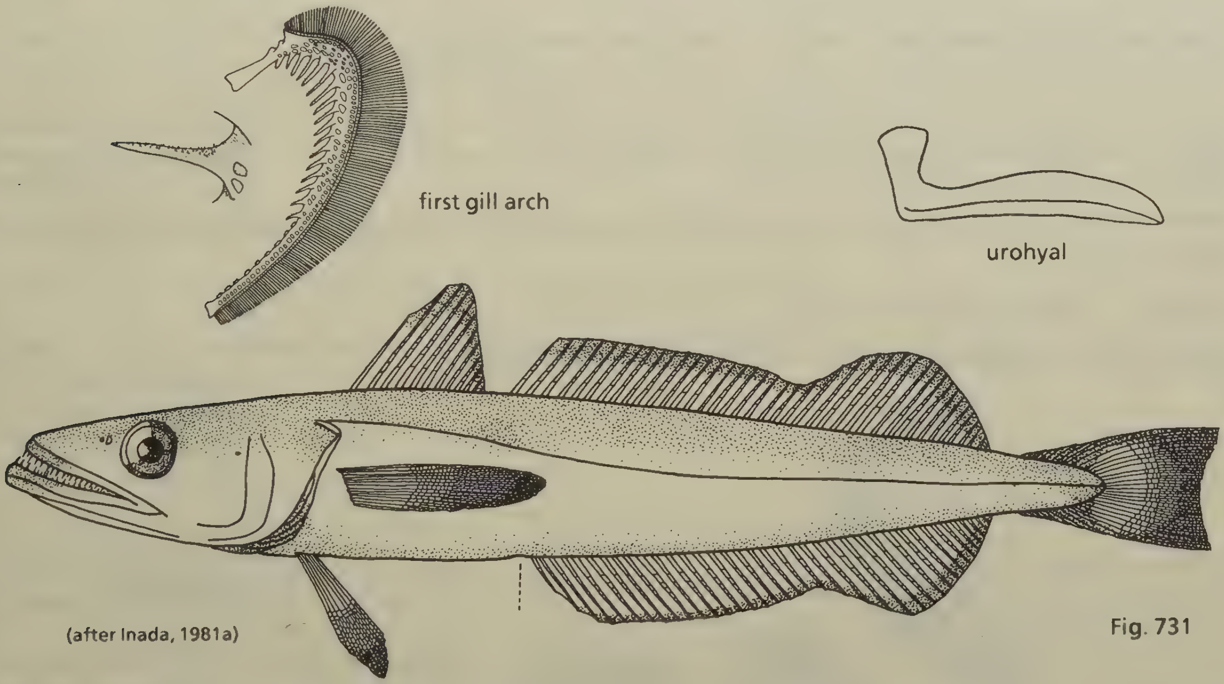
Fig. 731

MERLU Merlu 8

Scientific Name with Reference : ***Merluccius capensis*** Castelnau, 1861, Mém.poiss.Af.austr.:68 (South Africa).

Synonyms : ***Merluccius merluccius capensis***: Franca, 1962.

FAO Names : **En** - Cape hake; **Fr** - Merlu du Cap; **Sp** - Merluza del Cabo.



(after Inada, 1981a)

Fig. 731

Diagnostic Features : Head large, 27.3 to 30.2% of standard length. Measurements in relation to head length: upper jaw 48.2 to 54.7%; snout 31.9 to 36.5%; interorbital width 24.1 to 28.6%; total number of gill rakers on first arch 15 to 20 (usually 16 to 20). First dorsal fin with 1 spine and 9 to 11 rays; second dorsal fin with 38 to 43 rays; anal fin with 37 to 41 rays; tips of pectoral fins usually reaching origin of anal fin; posterior margin of caudal fin truncate or slightly concave. Scales small, 132 to 149 along lateral line. Number of vertebrae 23 to 26 (precaudal) + 24 to 28 (caudal) = 49 to 53 (total). **Colour:** silvery, somewhat brownish on back, whitish on belly.

Geographical Distribution : Southern and southwestern Africa, from Baie Farte (12.5°S), over the Agulhas Bank in the south, to Natal (28°S). Also found on the Valdivia Bank (26°18'S, 6°20'E) (Fig. 732).

Habitat and Biology : Lives close to the bottom on the continental shelf and upper slope (550 m). Females grow faster than males, with sexual maturity attained at 45 to 60 cm in the Cape region. Spawning appears to be mainly from October to December (mid-spring to early summer). This hake migrates seasonally southward in the southern spring, and northward in autumn. The young (to about 64 cm) feed mainly on small crustaceans and small deep-sea fishes such as lantern fishes, whereas larger individuals feed chiefly on small hakes and jack mackerel.

Size : Maximum length 120 cm; commonly 40 to 60 cm.

Interest to Fisheries : An important foodfish. Catch statistics reported to FAO combined this species with ***M. paradoxus.*** The catch reported for 1987 totalled 444 348 metric tons (mainly: Spain: 149 701 t; South Africa: 138 387 t; USSR: 82 897). Until 1978, this species, together with ***M. paradoxus*** yielded the largest hake catches in the world (i.e. 1 111 000 t in 1972). The potential catch of Cape hake stocks off Namibia and South Africa is estimated to be around 620 000 t. Caught mainly with bottom trawls (otter trawls) at 550 m depth and processed into fish blocks.

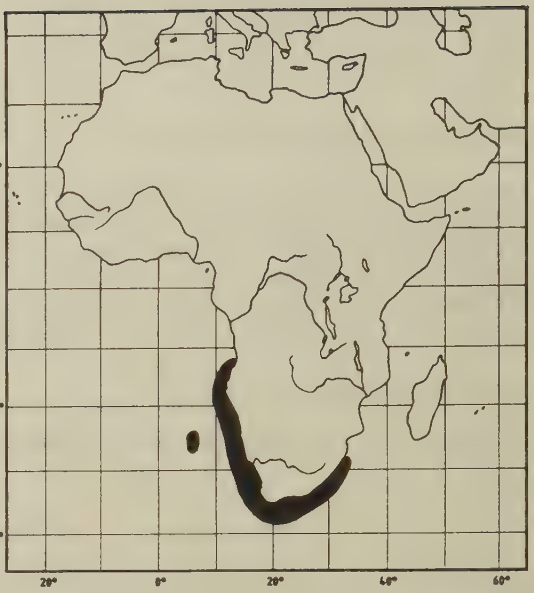


Fig. 732

Local Names : ANGOLA, PORTUGAL: Marmota, Pescada, Pescada-branca-do-Cabo, Pescada do reino; SOUTH AFRICA: Shallow-water hake, Viakwater stokvis.

Literature : Jones & van Eck (1967); Newman (1977); Inada (1981a).

Merluccius gayi (Guichenot, 1848)

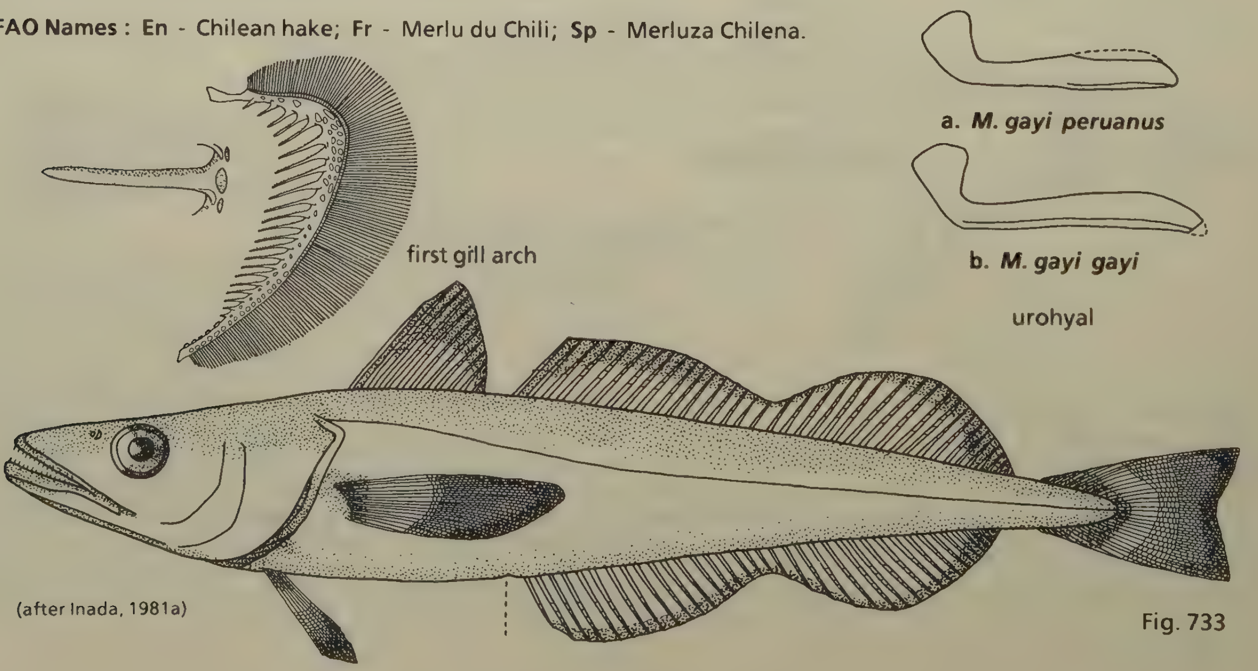
Fig. 733

MERLU Merlu 9

Scientific Name with Reference : ***Merlus gayi*** Guichenot, 1848, in Gay, Hist.fisica polit. Chile, Zool., 2:328 (off the coast of Chile).

Synonyms : ***Epicopus gayi***:Günther, 1860.

FAO Names : **En** - Chilean hake; **Fr** - Merlu du Chili; **Sp** - Merluza Chilena.



(after Inada, 1981a)

Fig. 733

Diagnostic Features : Head length 26.0 to 32.4% of standard length. Measurements in relation to head length: upper jaw 43.7 to 50.2%, snout length 29.3 to 34.1% and eye diameter 14.9 to 18.9%; gill rakers long and slender with pointed tips, total number on first arch 18 to 25 (mostly 19 to 23). First dorsal fin with 1 spine and 9 to 12 rays; second dorsal with 36 to 42 rays; anal fin with 36 to 42 rays; tips of pectoral fins always reaching to or extending beyond level of anal fin origin; caudal fin margin usually concave. Scales rather large, 106 to 130 along lateral line. Total number of vertebrae 48 to 53. **Colour:** silvery on back, silvery whitish on belly.

Geographical Distribution : Two subspecies are recognized. The Peruvian population (***M. gayi peruanus***) is distributed off the coast of Peru from Paita (5°S) southward to Huarmey (around 14°S), while the Chilean subspecies (***M. gayi gayi***) occurs off the coast of Chile from Arica (19°S) to the Chiloe Island (around 44°S) (Fig. 734).

Habitat and Biology : Occurs from shallow continental shelf waters (around 50 m depth) to the upper continental slope down to around 500 m. Sometimes found off the bottom or in mid-waters. Females grow faster than males and attain a much greater size. The main spawning period extends from August to March, with a peak in the southern spring (Peruvian subspecies), and from August to November (Chilean subspecies). The boundaries of the spawning ground of the Peruvian subspecies are estimated between 4°S and 8°S, while those of the Chilean subspecies are found in deep waters off Chile. The Chilean subspecies are found in deep waters off Chile. The Chilean subspecies feeds on fishes, crustaceans and squids.

Size : Estimated maximum length: Peruvian subspecies 68 cm (males) and 115 cm (females); Chilean subspecies 87 cm; common to 50 cm for both subspecies.

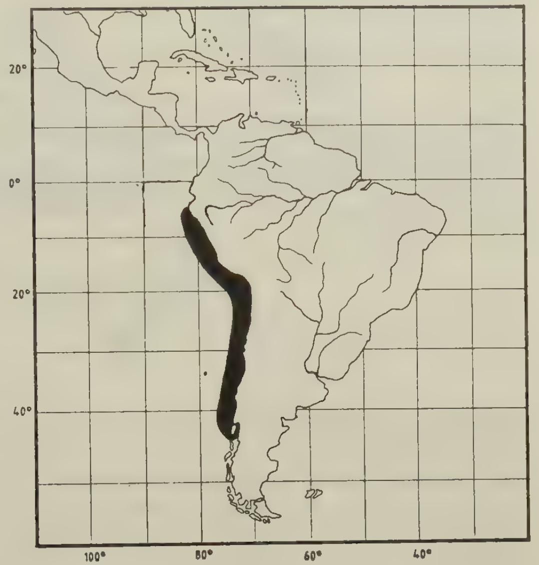


Fig. 734

Interest to Fisheries : The Peruvian population has recently become an important target fish for distant-water fisheries (from the sixties onwards). On the other hand, the Chilean subspecies has been an important food for the Chilean population since the forties. The combined catch for both populations reported to FAO in 1987 totalled 64 286 metric tons, of which 32 026 t were taken by Peru and 30 905 t by Chile. The yield of the fishery has decreased very considerably. Caught with artisanal purse-seines and trawls. Marketed fresh and frozen and also used for fishmeal.

Local Names : CHILE : Merluza; PERU : Huaycuya, Merlango, Merluza, Peje palo, Pescada, Pescadilla.

Literature : Ginsburg (1954); Poulsen (1957); Boerema (1977); Inada (1981a).

Remarks : The two subspecies differ by the total number of vertebrae, total number of gill rakers and relative length of head (Inada, 1981a).

Merluccius hubbsi Marini, 1933

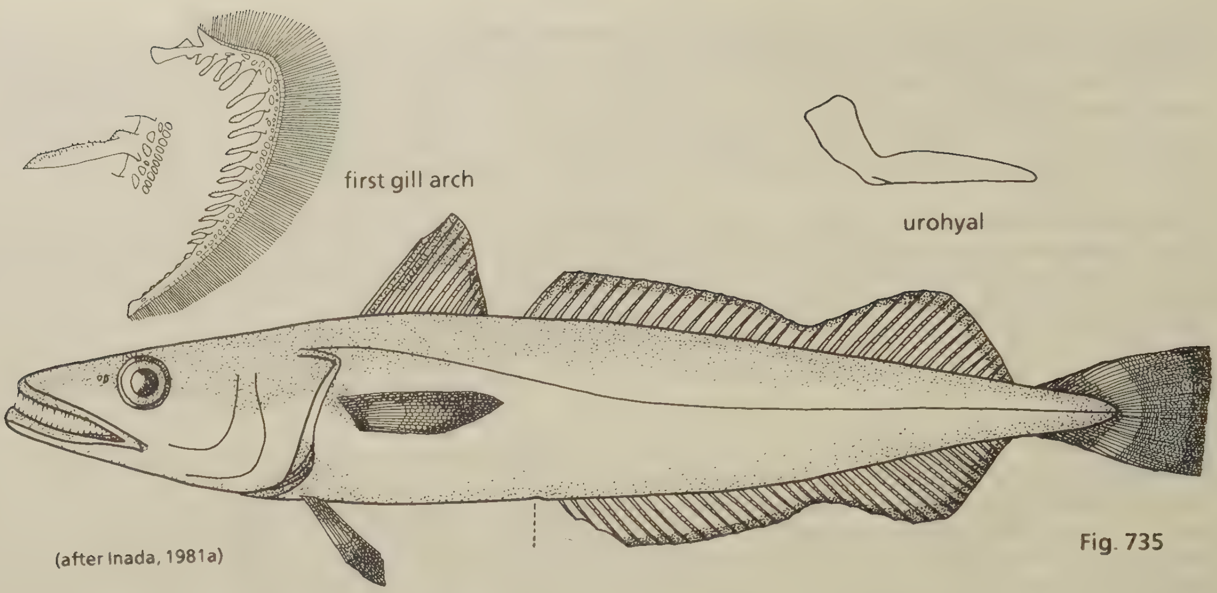
Fig. 735

MERLU Merlu 10

Scientific Name with Reference : ***Merluccius hubbsi*** Marini 1933, Rev.Physis, 11:322 (off the Provinces of Buenos Aires and Patagonia).

Synonyms : ***Merluccius gayi*** (nec Guichenot, 1848):Cunningham, 1871; ***Merluccius bilinearis*** (nec Mitchill, 1814):Ribeiro, 1915; ***Merluccius gayi hubbsi***:Mann, 1954; ***Merluccius merluccius hubbsi***:Angelescu et al., 1958.

FAO Names : **En** - Argentine hake; **Fr** - Merlu d'Argentine; **Sp** - Merluza Argentina.



(after Inada, 1981a)

Fig. 735

Diagnostic Features : Head short, 24.4 to 28.0% of standard length. Measurements in relation to head length: upper jaw 47.3 to 52.2%; snout 31.0 to 35.1%; eye diameter 15.5 to 20.7%; gill rakers short and thick with blunt tips, total number on first arch 12 to 16 (usually 13 to 16). Urohyal bone of hyoid arch thickened. First dorsal fin with 1 spine and 9 to 12 rays; second dorsal fin with 34 to 40 rays; anal fin with 36 to 41 rays; pectoral fins rather short, their tips not reaching origin of anal fin; caudal fin margin usually truncate in adults, but sometimes convex in smaller fish. Scales rather large, 120 to 142 along lateral line. Total number of vertebrae 50 to 53. **Colour:** silvery with golden luster on back, silvery white on belly.

Geographical Distribution : East coast of southern South America, from about 28° to 30°S off southern Brazil, to around 54°S near the Falkland-Malvinas Islands (Fig. 736).

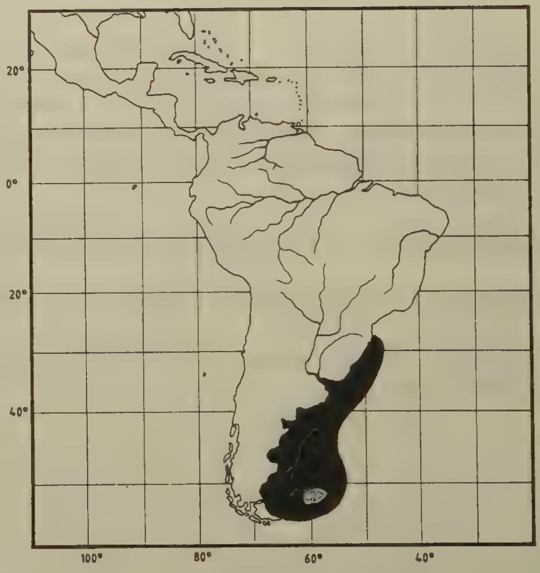


Fig. 736

Habitat and Biology : Inhabits continental shelf depths between 50 and 500 m (mainly 100 to 200 m), at temperatures between 3.8 and 6.5°C (mainly around 5.5°C). Females grow faster than males from 3 years of age onwards; spawning occurs in early summer (late October to February) in inshore areas: off the Patagonian shelf, from December to January north of 47°S; and from October to November south of this latitude; while north of 39°S, it occurs later, in autumn. Spawning grounds are located mainly in coastal waters shallower than 100 m, between 42 and 45°S, mainly off of Rio de la Plata. In the southern summer, the species concentrates in shallow waters between 50 and 150 m in the area south of 40°S; in winter the population moves northward to concentrate in the area between 35°S and 40°S at depths between 70 and 500 m. Seasonal onshore-offshore migrations are undertaken, i.e., inshore during spring and summer, and offshore into deep water wintering areas after spawning, as well as diel vertical migrations, probably related to feeding. First maturity is reached around 36 cm (total length) for males and 40 cm for females. Fishes larger than 60 cm are mainly composed of females. Large hake feed on fish (anchovies, hake, nototheniids, myctophids and Southern blue whiting), squids and macrozooplankton (euphausiids and amphipods); smaller individuals feed on mysids and amphipods.

Size : Maximum 95 cm total length; males common to 50 cm, females to 60 cm.

Interest to Fisheries : Argentine hake has been an important constituent of the coastal fisheries of Argentina and Uruguay. Recently foreign vessels have started to catch this hake in considerable quantities. The catch reported to FAO for 1987 totalled 434 472 metric tons (Argentina: 314 220 t; Uruguay: 83 693 t and Japan: 14 144 t), representing a decrease compared with catches of earlier years (i.e. 598 000 t in 1967). Nevertheless, this constitutes the largest catch recorded at present for a single hake species. Standing stock estimates range between 2.7 and 6.9 million t per year, offering an alternative to shortages of the Atlantic cod. Marketed fresh (Argentina, Uruguay) and frozen by foreign distant-water trawlers; also exported for filets and fish blocks to USA.

Local Names : ARGENTINA: Merluza; CHILE : Merluza austral, Pescada de la Patagonia; URUGUAY: Merluza.

Literature : Hart (1946); Zinkevich & Sauskan (1968); Boerema (1977); Inada (1981a); FAO (1983).

Merluccius merluccius (Linneaus, 1758)

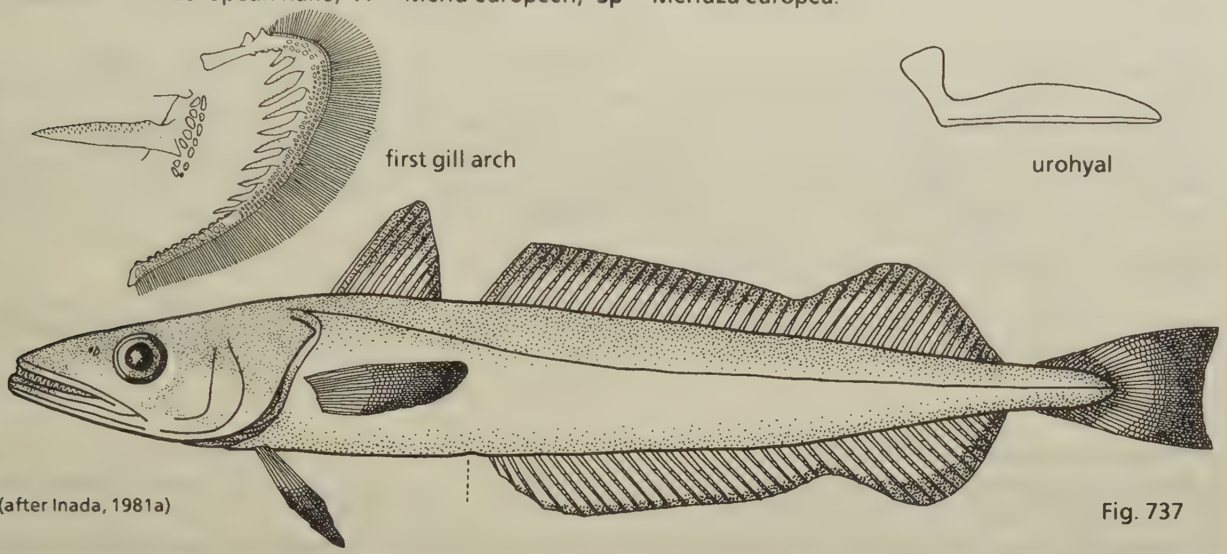
Fig. 737

MERLU Merlu 1

Scientific Name with Reference : ***Gadus merluccius*** Linnaeus, 1758, Systema Naturae, ed. X:254 (locality 'Habitat in Oceano').

Synonyms : ***Gadus ruber*** Lacepède, 1803; ***Merluccius smiridus*** Rafinesque, 1810; ***Onus riali*** Rafinesque, 1810; ***Merlucius esculentus*** Risso, 1826; ***Merluccius vulgaris*** Fleming, 1828; ***Hidronus marlucius*** Minding, 1832; ***Merlucius sinuatus*** Swainson, 1838; ***Merlucius ambiguus*** Lowe, 1840; ***Merlucius lanatus*** Gronow, 1854; ***Merluccius argentatus*** Günther, 1862; ***Merluccius linnei*** Malm, 1877; ***Onus guttatus*** Collett, 1890; ***Trachinoides maroccanus*** Borodin, 1934.

FAO Names : **En** - European hake; **Fr** - Merlu européen; **Sp** - Merluza europea.



(after Inada, 1981a)

Fig. 737

Diagnostic Features : Body long and rather slender compared with other hake species. Head large, 25.1 to 30.5% of standard length. Measurements in relation to head length: upper jaw 47.8 to 53.5%; snout 30.2 to 34.5%; interorbital space 21.5 to 28.4%; gill rakers short and thick, with blunt tips; total number of gill rakers on first arch 8 to 11 (mostly 9 to 11). First dorsal fin with 1 spine and 7 to 10 rays; second dorsal with 36 to 40 rays; anal fin with 36 to 40 rays; tips of pectoral fins reaching to level of anal origin in young fish (below 20 cm standard length) but not in adults; caudal fin margin usually truncate, but becoming progressively forked with growth. Scales small, 127 to 156 along lateral line. Number of vertebrae 23 to 25 (precaudal) + 25 to 29 (caudal) = 49 to 54 (total). **Colour:** steel grey on back, lighter on sides and silvery white on belly.

Geographical Distribution : Atlantic coast of Europe and western North Africa; northward to Norway and Iceland, southward to Mauritania. Also found in the Mediterranean Sea and along the southern coast of the Black Sea (see Remarks) (Fig. 738).

Habitat and Biology : The European hake is usually found between 70 and 370 m depth, but may also occur within a wider depth range, from inshore waters (30 m) to 1 000 m. It lives close to the bottom during day-time, but moves off-bottom at night. The spawning period is very long and varies with populations, (latest in the northern part of the range): December-June in the Mediterranean, February-May in the Bay of Biscay, April-July off W. Iceland, and May- August off W. Scotland. In the Mediterranean, spawning occurs between 100 and 300 m depth, in the Celtic Sea, above 150 m. Up to age 3,

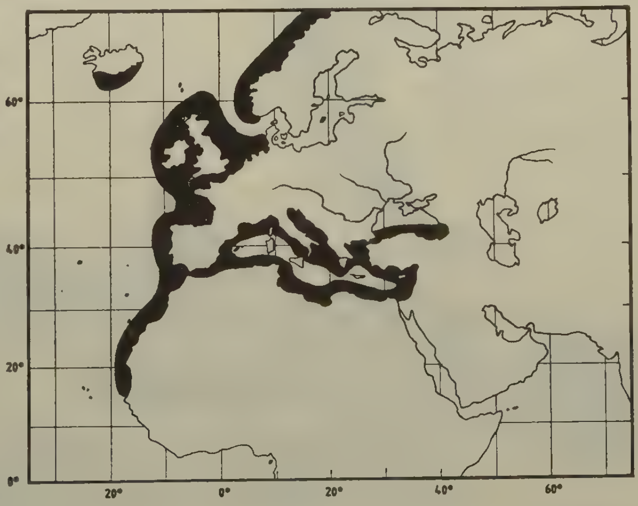


Fig. 738

juveniles live on muddy bottoms, moving toward the coast at age 3. First maturity is reached during the seventh year for most females (57 cm) and during the fifth year for males (40 cm) for the Atlantic population; in the Mediterranean, males mature at 26-27 cm, females at 36-40 cm. Females grow faster than males. At the end of 2 years, the fish reach 24-25 cm; at 20 years: 79 cm for males and 100.5 cm for females. The Mediterranean stock grows slower. The fecundity is reported as 2 to 7 million eggs per female. Adults feed mainly on fish (small hakes, anchovies, sardines and gadoid species) and squids. The young feed on crustaceans (especially euphausiids and amphipods).

Size : Maximum length: 140 cm and 15 kg weight; commonly from 30 to 60 cm.

Interest to Fisheries : European hake has been an important food for the population of western Europe throughout historic times. It is primarily caught by bottom and pelagic trawls but also with longlines, bottom-set gill-nets lines and Danish seines. The main fishing grounds are the areas north and west of Scotland, west and south of Ireland, the Bay of Biscay, the Portuguese coast and the coast of western North Africa. The catch reported to FAO for 1987 totalled 116 987 metric tons, of which 72 455 t were taken in the eastern North Atlantic (mainly by Spain: 33 370 t; France: 18 145 t and Portugal: 6 892 t), 34 585 t in the Mediterranean (mainly Italy: 25 093 t, Spain: 4 758 t and Greece: 3 025 t), 9 947 t in the eastern Central Atlantic (mainly Morocco: 3 990 t Spain: 3 023 t, and Italy 1 502 t). The potential yield of this hake in the eastern North Atlantic is estimated at around 150 000 t. Regularly marketed, mainly fresh, but also frozen (especially on distant fishing grounds), dried, salted and canned.

Local Names : ALGERIA: Merluzzo; DENMARK: Kulmule; EGYPT: Nazelli; FINLAND: Kummeli; FRANCE: Brochet de mer, Merlu, Merluche, Merluchón (small); GERMANY (FR): Hechtdorsch, Seehecht; GREECE: Bakaliáros; ICELAND: Lysingur; ISRAEL: Saai, Saqqaya; ITALY: Merluzzo, Nasello; MALTA: Marloz; NETHERLANDS: Stokvisch heek; NORWAY: Lysing; POLAND: Morszczuk; PORTUGAL: Marmota, Pescada, Pescadinha; SPAIN: Carioca (breeding), Merluza, Pescadilla (young); SWEDEN: Kummel; TUNISIA: Nasalli; TURKEY: Berlam; UK: Hake, Herring hake; USSR: Merluzovye, Merluzy; YUGOSLAVIA: Oslic.

Literature : Svetovidov (1948, 1973); Inada (1981a and b).

Remarks : This species is separated in two distinct subspecies: ***Merluccius merluccius smiridus*** Rafinesque, 1810 for the Mediterranean population and ***M. merluccius merluccius*** (Linnaeus, 1758) for the Atlantic population.

Merluccius paradoxus Franca, 1960

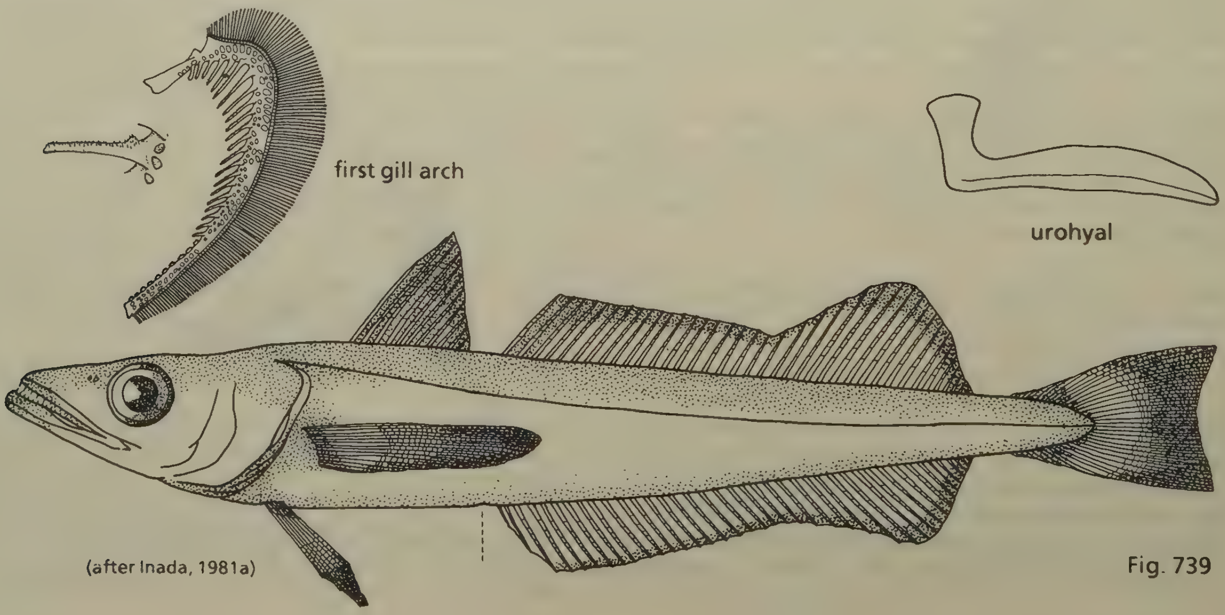
Fig. 739

MERLU Merlu 11

Scientific Name with Reference : ***Merluccius capensis paradoxus*** Franca, 1960, Mem.Junta Inv.Ultram., 2(18):4 (southwest Africa).

Synonyms : ***Merluccius merluccius paradoxus*** Franca, 1962.

FAO Names : **En** - Deepwater Cape hake.



(after Inada, 1981a)

Fig. 739

Diagnostic Features : Head large, its length 26.0 to 28.6% of standard length. Measurements in relation to head length: upper jaw 46.0 to 51.6%; snout length 30.6 to 35.3%; interorbital width 22.5 to 28.0%; gill rakers long, slender, numerous, with pointed tips; total number on first arch 18 to 23. First dorsal fin with 1 spine and 9 to 11 rays; second dorsal fin with 38 to 42 rays; anal fin with 38 to 41 rays; pectoral fins rather long, and reaching to or beyond origin of anal fin. Scales small, 121 to 143 along lateral line. Number of vertebrae 26 to 28 (precaudal) + 28 to 30 (caudal) = 54 to 58 (total). **Colour:** dark brownish on back, silvery whitish on belly.

Geographical Distribution : Southern and southwestern Africa, from Cape Frio (18°S) south to the Agulhas Bank, and east to East London; also found on the Madagascar Ridge (33°S 44°E)(Fig. 740).

Habitat and Biology : The deep-water Cape hake lives close to the bottom at continental slope depths from 200 m to at least 850 m, occurring generally deeper in the north (450 m or more) than in the south (300 to 350 m). Females grow faster than males. Spawning probably occurs from September to November. Feeds on fishes, mysids, euphausiids and squids; the young feed mainly on euphausiids, but the diet becomes polyphagous with growth.

Size : Estimated maximum length: 82 cm (females), 53 cm (males); commonly 40 to 60 cm.

Interest to Fisheries : Catch statistics for this hake are not separated from those of the shallow-water Cape hake (***M. capensis***) because of the similar appearance of these two species. The species has probably been a significant component in the distant-water catches of fleets since 1962.

Local Names : ANGOLA, PORTUGAL: Marmota, Pescada; SOUTH AFRICA: Deepwater hake, Deepwater stockvis.

Literature : Botha (1973); Quero (1973); Inada (1981a).

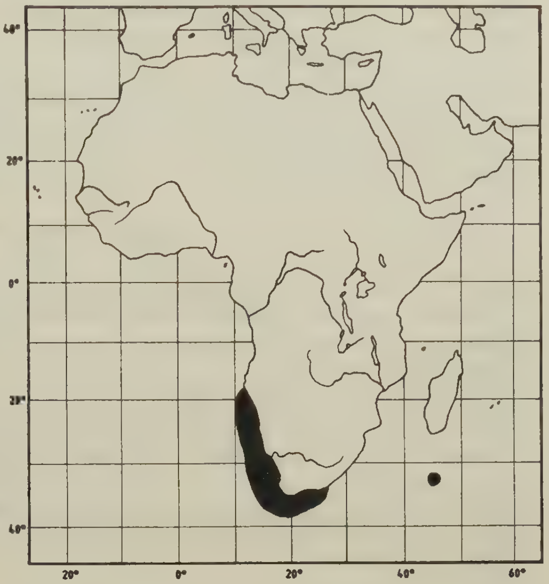


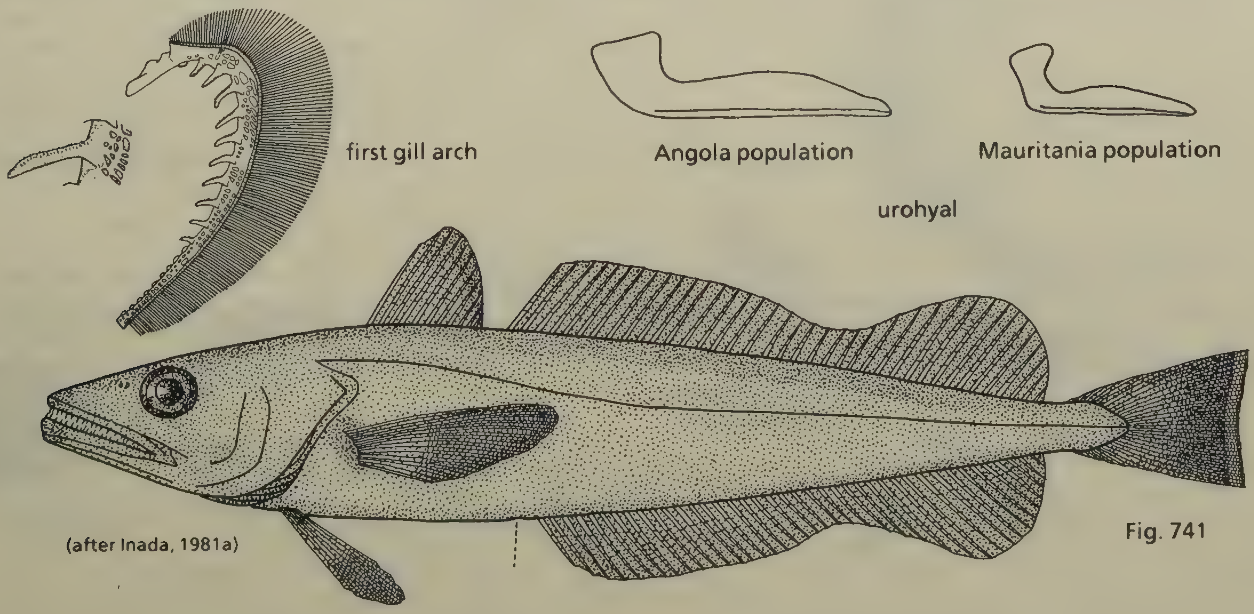
Fig. 740

Merluccius polli **Cadenat, 1950** Fig. 741 **MERLU Merlu 4**

Scientific Name with Reference : ***Merluccius polli*** Cadenat, 1950, Cong.pêche.pêcher.Un.franç. d'outre Mer: 129 (Congo).

Synonyms : ***Merluccius cadenati*** Doutre, 1960; ***Merluccius merluccius polli***: Franca, 1962; ***Merluccius merluccius cadenati***: Franca, 1962.

FAO Names : En - Benguela hake; **Fr** - Merlu d'Afrique tropicale; **Sp** - Merluza de Benguela.



(after Inada, 1981a)

Fig. 741

Diagnostic Features : Head large and little depressed, 24.8 to 28.9% of standard length. Measurements in relation to head length: upper jaw length 45.3 to 51.3%; snout 30.2 to 35.9%; interorbital width 24.1 to 28.0%; gill rakers short and thick with blunt tips; total number of gill rakers on first arch 8 to 12. First dorsal fin with 1 spine and 8 to 11 rays; second dorsal with 37 to 41 rays; anal fin with 36 to 42 rays; tips of pectoral fins usually reaching origin of anal fin, but not in large individuals; caudal fin margin truncate, but sometimes concave. Scales easily shed, 102 to 127 along lateral line. Number of vertebrae 23 to 28 (precaudal) + 27 to 31 (caudal) = 53 to 57 (total). **Colour:** usually blackish on back, steel grey to blackish on belly; caudal fin white-edged.

Geographical Distribution : Atlantic coast of tropical West Africa, from Mauritania (20°N) to Angola (18.5°S) (Fig. 742).

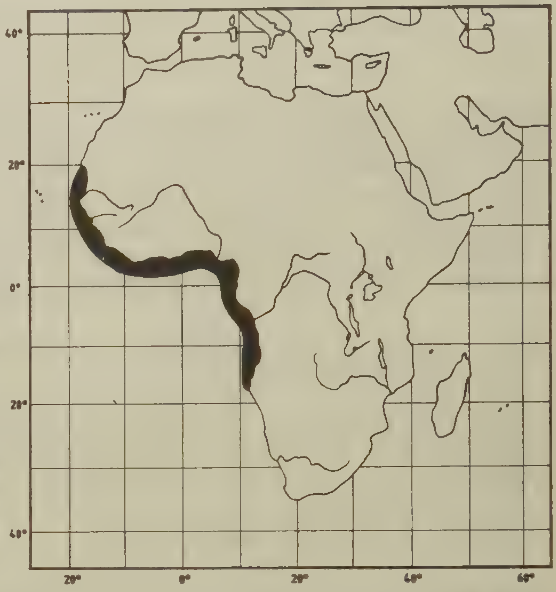


Fig. 742

Habitat and Biology : The Benguela hake lives close to the bottom on the continental shelf and slope, from 50 m to 550 m depth. It feeds mainly on small fishes and partly on squids and shrimps.

Size : Maximum length: 80 cm; common to 38 cm.

Interest to Fisheries : This hake is taken on offshore grounds on the deeper parts of the shelf and on the slope, mainly with bottom (otter) trawls. Catch statistics are available only for the southern part of the distribution (77 t in 1987). Further north, it is caught together with ***M. senegalensis*** and catch data of these two species are combined. Marketed mostly fresh and frozen, also used for fishmeal and oil. This hake has not been exploited commercially until recently. The stock size has not been estimated, but this species is probably of little economic potential because of its low catch rates, deep habitat and relatively small size.

Local Names : ANGOLA, PORTUGAL: Marmota, Pescada-de-Angola; SENEGAL: Merlu.

Literature : Williams (1968); Inada (1981a and b).

Merluccius productus (Ayres, 1855)

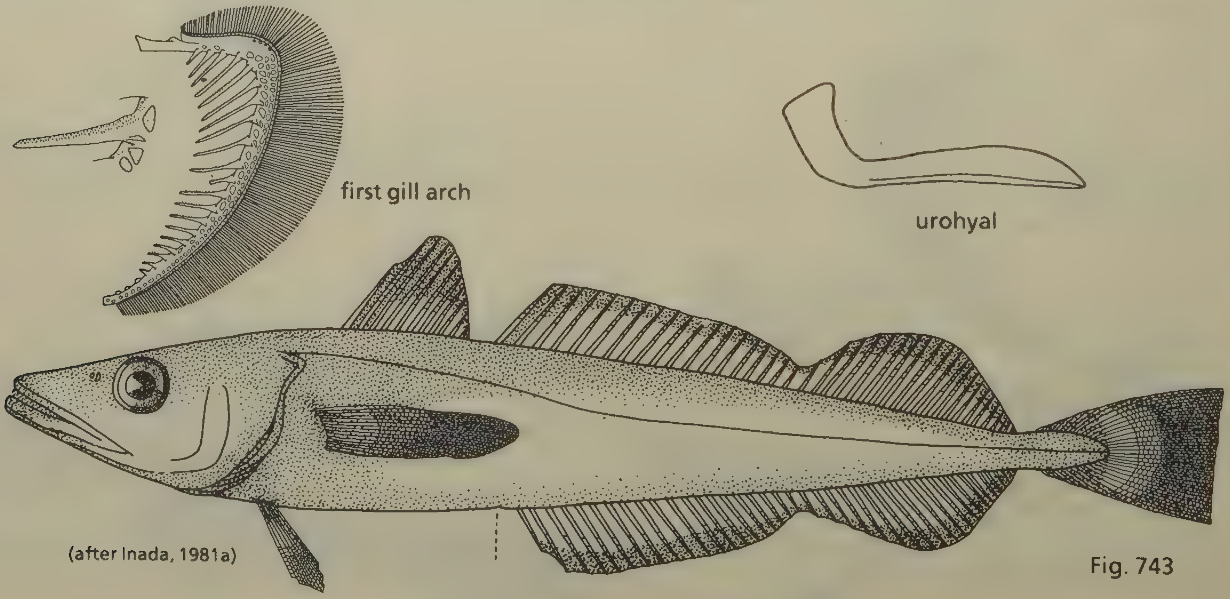
Fig. 743

MERLU Merlu 12

Scientific Name with Reference : ***Merlangus productus*** Ayres, 1855, Proc.Cal.Acad.Nat.Sci., 1:64 (San Francisco).

Synonyms : ***Homalopomus trowbridgii*** Girard, 1856.

FAO Names : **En** - North Pacific hake; **Fr** - Merlu du Pacifique nord; **Sp** - Merluza del Pacifico Norte.



(after Inada, 1981a)

Fig. 743

Diagnostic Features : Head rather short, 24.7 to 28.9% of standard length. Measurements in relation to head length: upper jaw 45.8 to 50.9%, snout 31.1 to 35.4%; eye diameter 12.7 to 20.0%; gill rakers long and slender with pointed tips, total number on first arch 18 to 23. First dorsal fin with 1 spine and 9 to 12 rays; second dorsal with 39 to 44 rays; anal fin with 39 to 44 rays; tips of pectoral fins usually reaching to or extending beyond origin of anal fin; caudal fin margin always concave. Scales along lateral line 125 to 144. Total number of vertebrae 53 to 54. **Colour:** silvery on back, whitish on belly.

Geographical Distribution : West coast of North America from the northern part of Vancouver Island to the northern part of the Gulf of California, mainly ranging between 23°N and 48°N. A record from the Gulf of Alaska is doubtful (Fig. 744).

Habitat and Biology : Occurs from shallow shelf (or surface and estuarine) waters to depths of 900 to 1 000 m, but is mainly concentrated on the continental shelf. Commercial concentrations are found between 45 and 500 m depth. Although often classified as a demersal species, its distribution and behaviour suggest a largely pelagic existence. Lives in both, oceanic and coastal areas. Adults live in large schools in waters overlying the continental shelf and slope except during the spawning season when they are found several hundred miles seaward. Growth is relatively fast, especially during the first 4 years; lives up to 15 years. Begins to mature at 3 years of age and most individuals are mature at 4 years and about 35 to 42 cm length. A pelagic spawner, females laying, depending on their size, 80 000 to 500 000 eggs. Spawning occurs mainly in deep waters off southern California and Baja California in winter and spring (from January to April or June). This hake migrates northward to southern Oregon in summer and autumn (from July to September), and begins to return by December. The northward migration is accompanied by movement toward shore and into shallower water, while the southward migration is accompanied by movement into deeper water and seaward. Feeds on a large variety of fishes and invertebrates, and in turn is preyed upon by larger fishes.

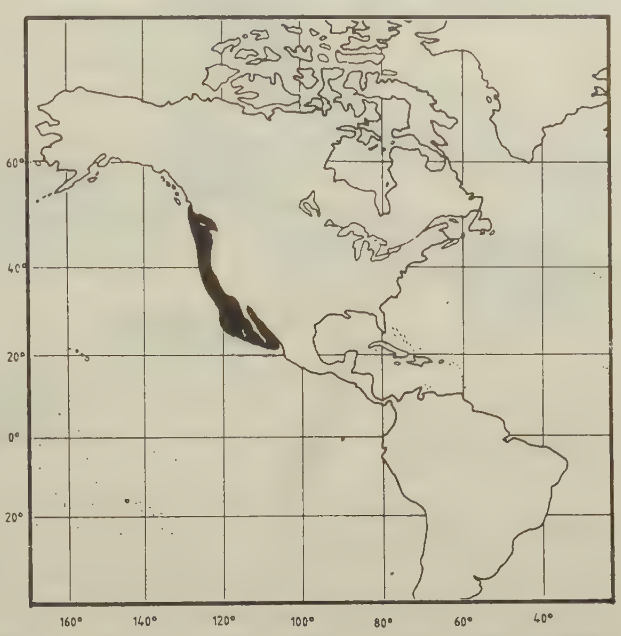


Fig. 744

Size : Maximum recorded length 91 cm; common to 60 cm.

Interest to Fisheries : Since the inception of the USSR hake fishery in 1966 (150 000 t 1966), this species has been an important consituent of distant-water fisheries. Most of the US catch was used for fish meal and pet food while the Soviet catch was frozen for human consumption, as soon as they were caught (this hake tends to become soft and less palatable from 2 to 4 hours after being caught). The catch reported to FAO in 1987 totalled 297 976 metric tons (almost exclusively from the Northeastern Pacific) of which 229 586 t were taken by USA, and 57 989 t by Poland. There has been a substantial decrease in the catches during the past decade (i.e. 238 000 t in 1976; 99 297 t in 1985) and since 1986, catches are increasing. An estimate of population size is about 1.2 million t, the estimated maximum sustainable yield ranges from 120 000 to 270 000 t (Dark et al., 1979). Caught with bottom and midwater trawls from the surface to 800 m. Marketed fresh and frozen fillets. Used also for fishmeal.

Local Names : MEXICO : Merluza; USA: Pacific hake, Whiting.

Literature : Grinols & Tillman (1970); Nelson & Larkins (1970); Frey (1971); Inada (1981a).

Merluccius senegalensis Cadenat, 1950

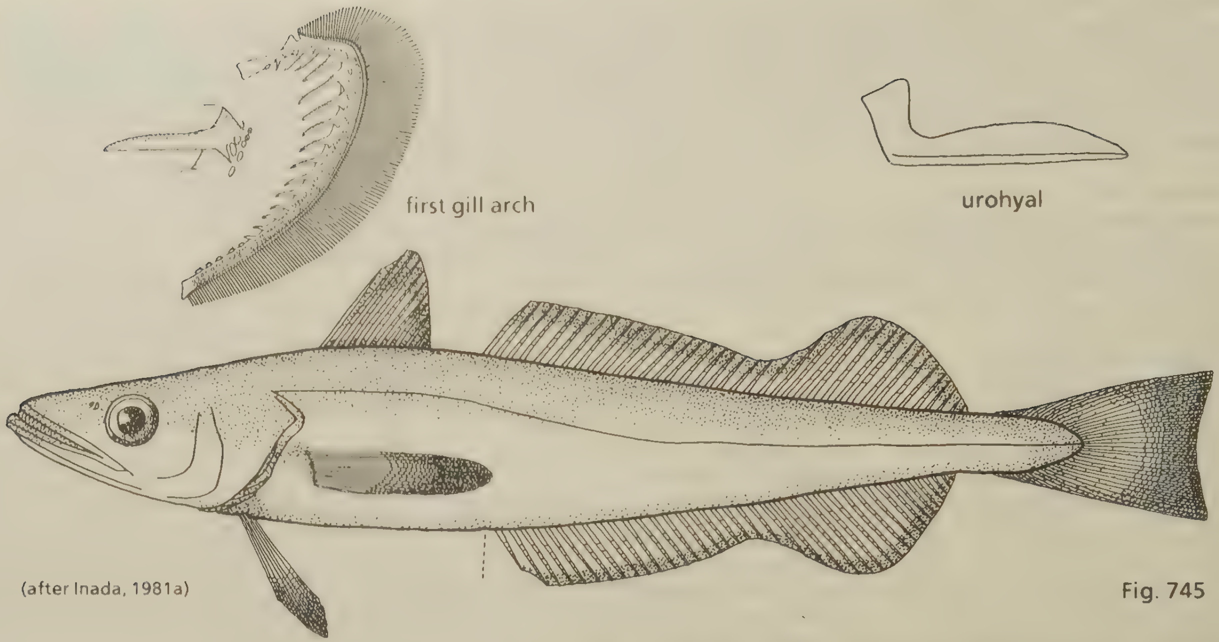
Fig. 745

MERLU Merlu 3

Scientific Name with Reference : ***Merluccius senegalensis*** Cadenat, 1950, Cong.pêche. pêcher.Un.franç. d'outre Mer: 129 (Dakar).

Synonyms : ***Merluccius merluccius senegalensis***: Franca, 1962.

FAO Names : **En** - Senegalese hake; **Fr** - Merlu du Sénégal; **Sp** - Merluza senegalesa.



(after Inada, 1981a)

Fig. 745

Diagnostic Features : Head rather long, 24.9 to 27.7% of standard length. Measurements in relation to head length: upper jaw 47.1 to 50.6%; snout 30.2 to 34.1%; interorbital width 27.0 to 31.0%; total number of gill rakers on first arch 13 to 18 (usually 13 to 16). First dorsal fin with 1 spine and 9 to 10 rays; second dorsal fin with 38 to 41 rays; anal fin with 37 to 40 rays; tips of pectoral fins usually reaching origin of anal fin; caudal fin margin usually truncated, but becoming progressively concave with growth. Scales small, 124 to 155 along lateral line. Number of vertebrae 25 to 28 precaudal + 25 to 29 caudal = 51 to 56 total. **Colour:** steel grey to blackish on back, silvery white on sides and belly.

Geographical Distribution : Atlantic coast of western North Africa, from Cape Cantin (33°N) to Cape Roxo (10°N). Senegalese hake overlaps the distribution of ***M. merluccius*** in the north and that of ***M. polli*** in the south (Fig. 746).

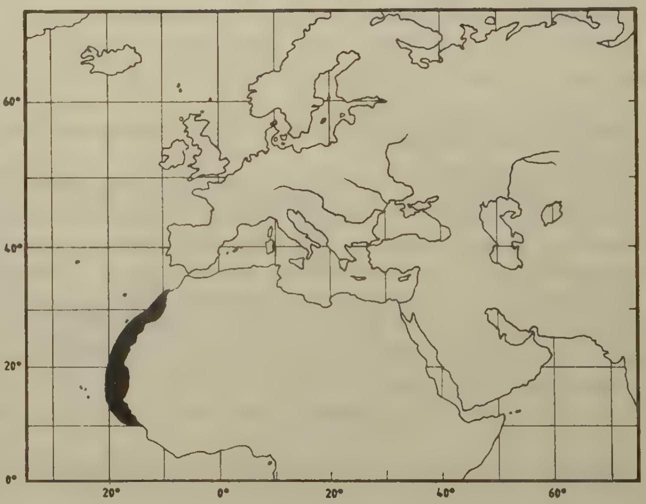


Fig. 746

Habitat and Biology : The Senegalese hake lives close to the bottom in shallow depths from about 18 to 500 m. Spawning probably occurs from January to March in about 300 m at temperatures of about 12°C. Feeds mainly on small fishes, and to a lesser extent on crustaceans and cephalopods.

Size : Maximum length: 81 cm; common to 42 cm.

Interest to Fisheries : Taken by bottom trawls in offshore grounds off Mauritania and Senegal together with two other hakes (***M. merluccius*** and ***M. polli***). The catch reported to FAO in 1987 totalled 7 469 metric tons (compared with 102 000 t in 1970, but which included the catch of ***M. polli***) of which 4 613 t were taken by USSR and 2 729 t by Spain. The stock size is not known, but the maximum sustainable yield is estimated to be rather low. Marketed fresh and frozen and also used for fishmeal and oil.

Local Names : SENEGAL: Merlu.

Literature : Doutre (1960); Inada (1981a and b);

Steindachneria Goode & Bean, 1888

MERLU Stein

Genus with Reference : ***Steindachneria*** Goode & Bean, in Agassiz, 1888:26. Type-species: ***Steindachneria argentea*** Goode & Bean, 1896, by the proposal of distinct genus.

Diagnostic Features : See species diagnosis.

Literature : Goode & Bean (1896).

Remarks : The subfamily Steindachneriinae and hence, its single genus ***Steindachneria,*** are characterized by the presence of a light organ, a unique character in this family. The genus includes a single species: ***Steindachneria argentea.***

Steindachneria argentea Goode & Bean, 1896

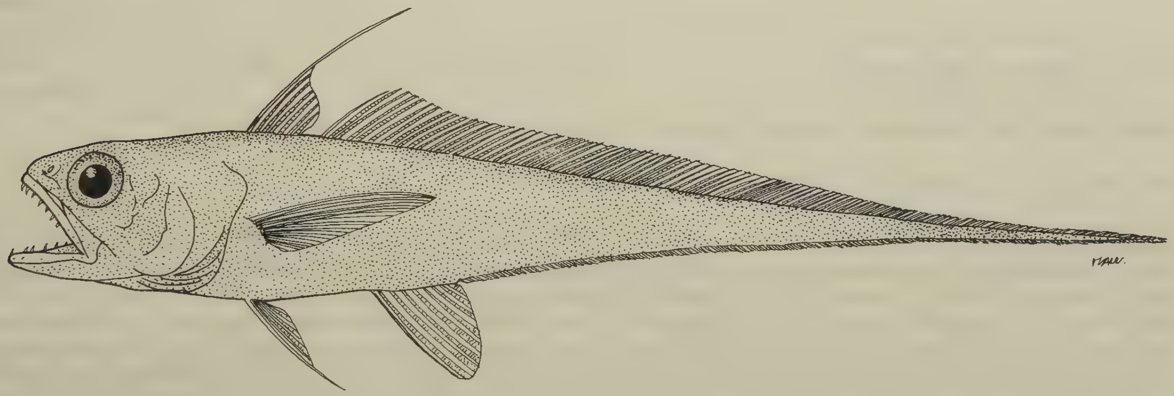
Fig. 747

MERLU Stein 1

Scientific Name with Reference : ***Steindachneria argentea*** Goode & Bean, 1896, Oceanic Ichthy.:419.

Synonyms : None.

FAO Names : En - Luminous hake.



(after Goode & Bean, 1896)

Fig. 747

Diagnostic Features : Body long, compressed, tail tapering to a very fine point; body deep at first dorsal-fin origin, contained 6.7 to 7.5 times in total length. Anus situated between pelvic fins widely separated from urogenital opening (which is anterior to anal-fin origin); the two openings are connected by a faint brownish stripe. A striated light organ present on ventral half of body and on sides of head. Head compressed, contained 5.2 to 5.5 times in total length; mouth large. Measurements in relation to head length: upper jaw slightly more than half, snout length 4.2 to 4.6 times, eye diameter 3.6 to 3.8 times, interorbital width 3.9 to 4.5 times. Nostrils placed nearer to eye than to tip of snout, the anterior nearly circular, the posterior much longer and crescent-shaped; postorbital space of head nearly twice as long as eye diameter. Teeth of outer series on upper jaw enlarged and wide-spaced, teeth of inner series smaller; teeth in lower jaw similar to those on outer series of upper jaw; vomerine teeth arranged in a single U-shaped row. Gill rakers slender, 5 on upper limb and 13 to 15 on lower limb; longest gill rakers nearly half as long as diameter. No pyloric caeca. First dorsal fin with one spine and 7 to 9 rays, the spine elongated and filiform, reaching to 14th ray of second dorsal when depressed; second dorsal with 123 or more rays, the longest (second) ray about 2/5 of head length; anal fin with 123 to more than 125 rays, its origin located under about the 6th ray of second dorsal, not far behind anus, its anterior, elevated portion consisting of 10 to 12 rays; longest (seond) ray of anal fin twice the eye diameter; pectoral fins with 14 to 17 rays, their tips extending to below the 15th second dorsal ray; first pelvic finray filamentous, reaching to anus when depressed. **Colour :** body silvery; upper part slight brownish, belly purplish; inside of mouth darker.

Geographical Distribution : Central western Atlantic (Fig. 748).

Habitat and Biology : Outer shelf and upper slope, on soft bottoms.

Size : Maximum total length recorded from Suriname, 27.7 cm.

Interest to Fisheries : None at present. Often taken in large quantities at depths of 400 to 500 m in the northern Gulf of Mexico.

Literature : Goode & Bean (1896).

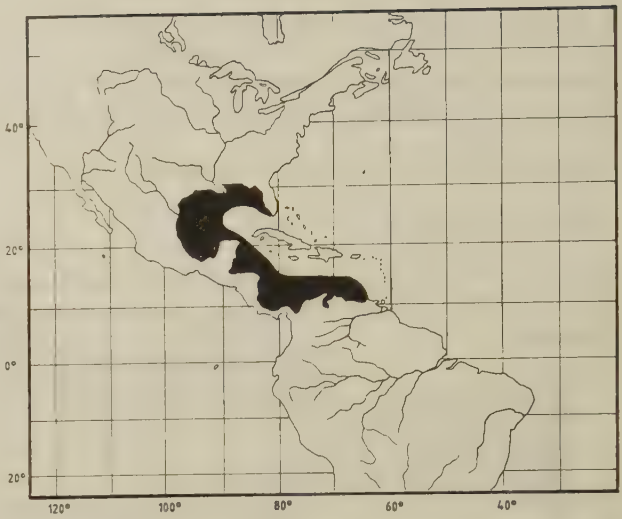


Fig. 748

2.8 FAMILY MORIDAE

MOR

Family Name with Reference : **Morini** Moreau, 1881, Hist.nat.Poiss.France, 3:247.

FAO Names : **En** - Moras; **Fr** - Moros; **Sp** - Moros.

General Features : Body, in most species, tapering to a very narrow caudal peduncle. No V-shaped ridge on top of skull; gill openings wide; extending upward above level of pectoral fins; mouth usually terminal or inferior. Teeth few or lacking on head of vomer (roof of mouth). Fins lacking spines; two or three dorsal fins and one or two anal fins; pelvic fins thoracic, never very close together at their bases; caudal fin always separate from dorsal and anal fins, end externally symmetrical. Scales overlapping and rounded, not set at right angles to each other. Spine on top of first vertebra tightly connected to a narrow crest at rear of skull. Anterior paired projections of swimbladder attached to a membranous area at the rear of the cranium. Several hypural bones attached to last vertebra. For additional characters, see Svetovidov, 1937, Marshall & Cohen, 1973, Paulin, 1983, and several authors in Cohen, 1989. **Colour:** brown to black; some species pink or reddish or with silvery areas.

Habitat, Distribution and Biology : Benthopelagic to pelagic species ranging from shallow coastal areas (occasionally even estuaries) to deep waters (beyond 2 500 m). Found in all oceans.

Interest to Fisheries : Morids are of less present and probably less potential value to the fishery than either Gadidae, Merlucciidae or Macrouridae. Most species are of rather small size, live in fairly deep water over hard bottom, and apparently do not form dense aggregations. The highest present and potential importance is in the temperate Southern Hemisphere. Overall landings for the family in 1986 were 37 000 t.

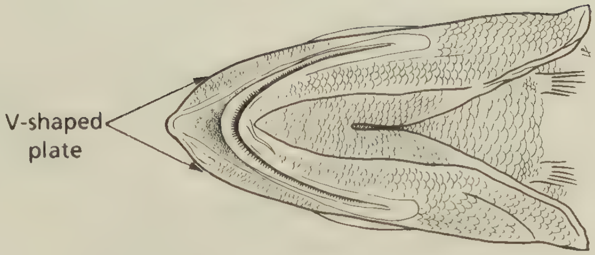
Remarks : The genera and species now included in this family were placed in Gadidae until Svetovidov (1937) recognized a separate family; most ichthyologists agree with him. Although Paulin, 1989 (in Cohen, 1989) presents an overview of Moridae, there is neither an up-to-date general classification of the perhaps 100 species, nor any substantial agreement as to how many genera should be recognized for them. Hence the following list of genera and species is tentative and incomplete. Because of unsolved taxonomic problems two generic keys are presented, one to Atlantic genera and one to Pacific-Indian Ocean genera.

Key to Atlantic Genera*:

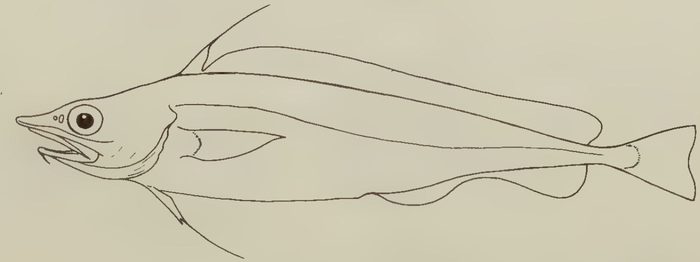
1a. Snout depressed to form a broadly V-shaped plate (Fig. 749) .... ***Antimora*** (Fig. 750)

1b. Snout not as above

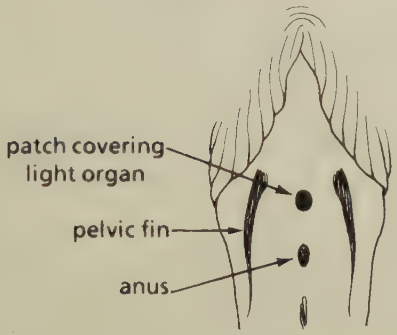
- **2a.** Ventral light organ present (Fig. 751)
  - **3a.** Chin barbel present
    - **4a.** Teeth lacking on vomer .... ***Physiculus*** (Fig. 752)
    - **4b.** Teeth present on vomer in a small patch (Fig. 753a) .... ***Salilota*** (Fig. 753b)
  - **3b.** Chin barbel absent .. ***Gadella*** (Fig. 754)



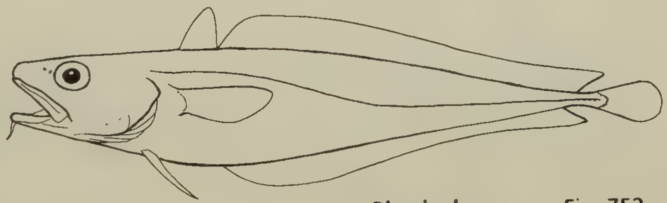
underside
Antimora Fig. 749



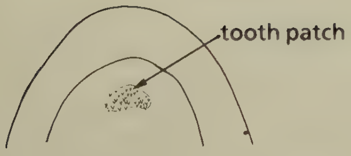
Antimora Fig. 750



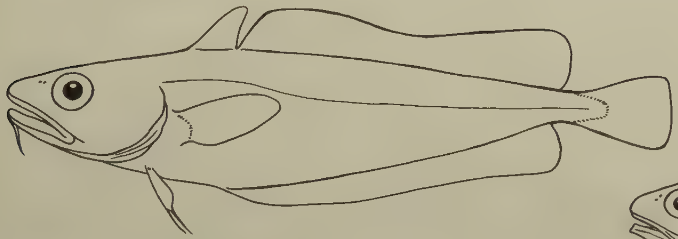
underside Fig. 751



Physiculus Fig. 752



a. roof of mouth



b. lateral view
Salilota Fig. 753

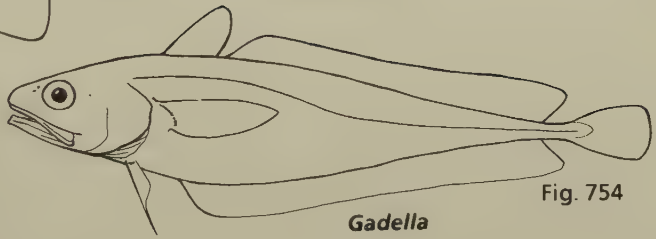


Fig. 754
Gadella

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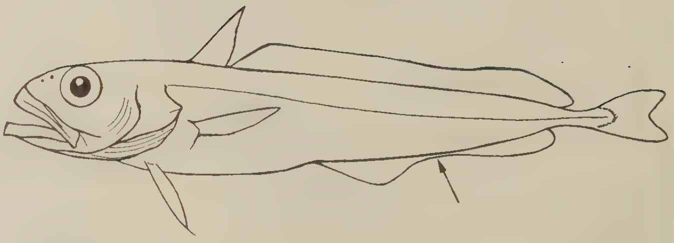
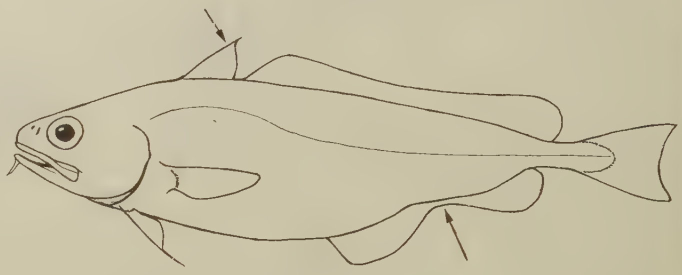
* Excluded are the nominal genera ***Eretmophorus***, ***Rhynchogadus*** and ***Svetovidovia*** which are either based on early life history stages of other genera, or are neotenic forms. Also ***Paralaemonema*** Trunov, 1990, which has been described too recently for inclusion, and ***Momonatira***, recently recorded from the Atlantic by Trunov, 1989.

2b. Ventral light organ lacking

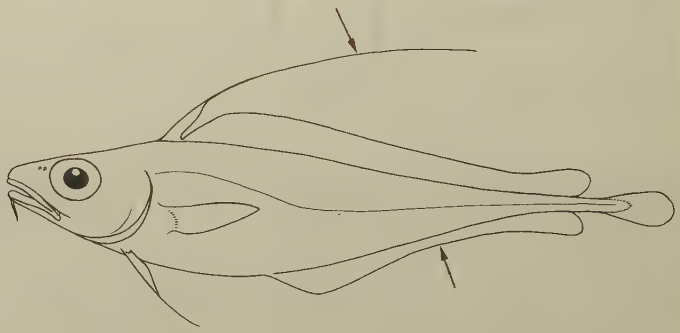
- **5a.** Anal fin notably indented; sometimes appearing as two fins
  - **6a.** Chin barbel absent .... ***Halargyreus*** (Fig. 755)
  - **6b.** Chin barbel present
    - **7a.** Longest ray in first dorsal fin much shorter than head length .... ***Mora*** (Fig. 756)
    - **7b.** Longest rays in first dorsal fin about equal to or longer than head length .... ***Lepidion*** (Fig. 757)
- **5b.** Anal fin not notably indented
  - **8a.** Pelvic fin composed of two well-developed long rays (sometimes with several rudimentary rays at the base) .... ***Laemonema*** (Fig. 758)
  - **8b.** Pelvic fin composed of more than two rays (although outer two are longer than others) .... ***Austrophycis*** (Fig. 759)



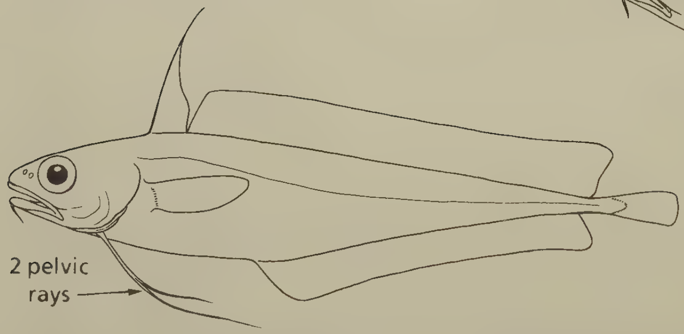
Halargyreus Fig. 755



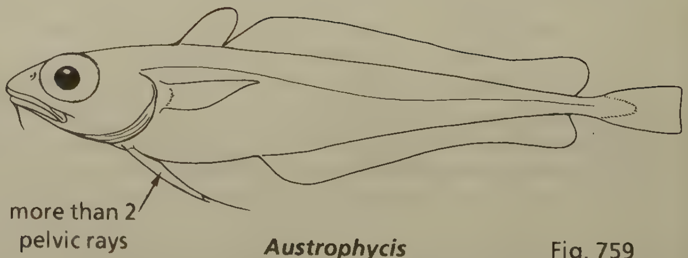
Mora Fig. 756



Lepidion Fig. 757



Laemonema Fig. 758



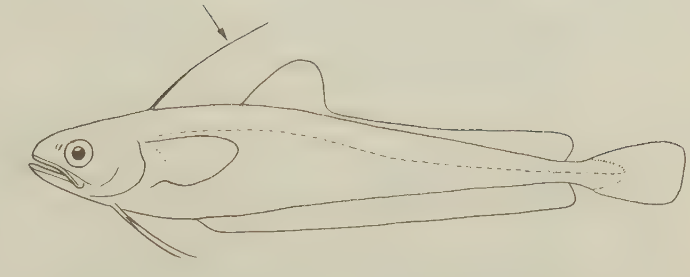
Austrophycis Fig. 759

Key to Pacific and Indian Ocean Genera:

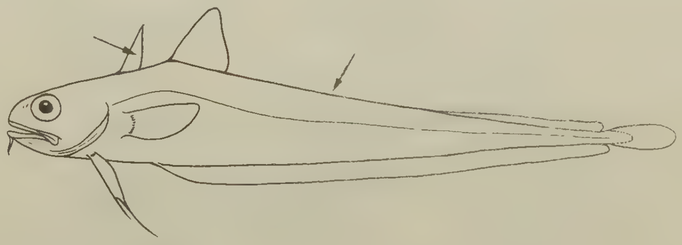
1a. Snout depressed to form a broadly V-shaped plate (Fig. 749) .... ***Antimora*** (Fig. 750)

1b. Snout not as above

- **2a.** First dorsal fin appearing as a single elongate ray .... ***Auchenoceros*** (Fig. 760)
- **2b.** First dorsal fin with three or more rays
  - **3a.** Dorsal fins appearing as three due to deep indentation in second dorsal fin .. ***Tripterophycis*** (Fig. 761)
  - **3b.** Dorsal fins appearing as two
    - **4a.** Ventral light organ present (Fig. 751)
      - **5a.** Teeth lacking on vomer
        - **6a.** Chin barbel present .... ***Physiculus*** (Fig. 752)
        - **6b.** Chin barbel absent .... ***Gadella*** (Fig. 754)
      - **5b.** Teeth present on vomer in a small patch (Fig. 753a) .... ***Salilota*** (Fig. 753b)
    - **4b.** Ventral light organ absent
      - **7a.** Anal fin notably indented, sometimes appearing as two fins
        - **8a.** Chin barbel absent .. ***Halargyreus*** (Fig. 755)
        - **8b.** Chin barbel present



Auchenoceros Fig. 760



Tripterophycis Fig. 761

9a. Longest ray in first dorsal fin much shorter than head length .... ***Mora*** (Fig. 756)

9b. Longest ray in first dorsal fin about equal to or longer than head length .... ***Lepidion*** (Fig. 757)

7b. Anal fin not notably indented

10a. Pelvic fin composed of two well-developed long rays (sometimes with several rudimentary rays at the base) .... ***Laemonema*** (Fig. 758)

10b Pelvic fin composed of more than two rays (although outer two may be longer than others)

11a. Upper jaw teeth in two separate series, the outer one much larger (Fig. 762a) .. ***Lotella*** (Fig. 762b)

11b. Upper jaw teeth in a single band, the teeth about equal-sized

12a. Eye diameter equal to or greater than postorbital length of head .... ***Austrophycis*** (Fig. 759)

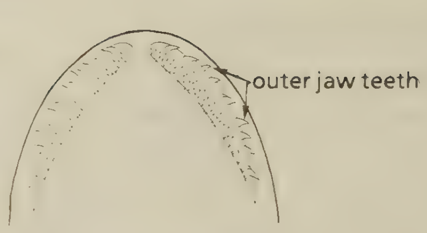
12b. Eye diameter less than postorbital length of head

13a. Chin barbel absent or very small .... ***Momonatira*** (Fig. 763)

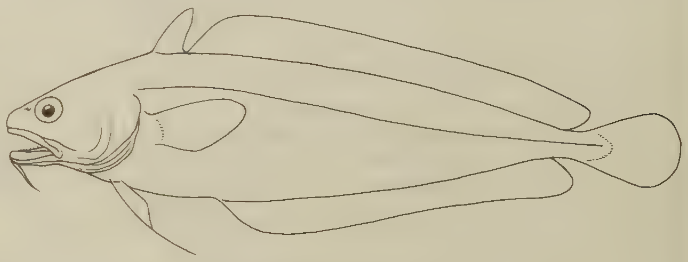
13b. Chin barbel present, prominent

14a. First dorsal fin with 8 to14 rays; scale rows between first dorsal fin and lateral line 13 to 16 .. ***Pseudophycis*** (Fig. 764)

14b. First dorsal fin with 6 rays; scale rows between first dorsal fin and lateral line 19 to 22 .... ***Eeyorius*** (Fig. 765)

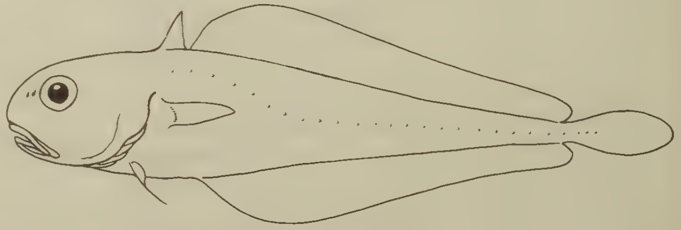


a. roof of mouth



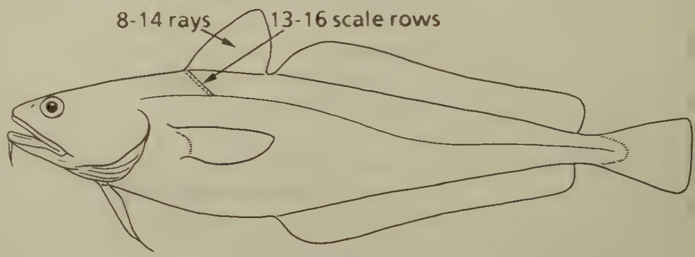
b. lateral view
Lotella

Fig. 762



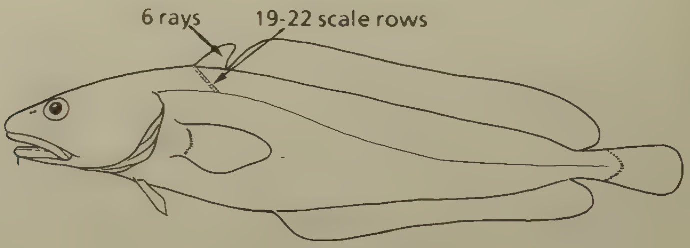
Momonatira

Fig. 763



Pseudophycis

Fig. 764



Eeyorius

Fig. 765

TENTATIVE LIST OF GENERA

	Number of species known	Species treated here
Antimora	2	2
Auchenoceros	1	1
Austrophycis	1	1
*Eretmophorus**	?	-
Eeyorius	1	1
Gadella	8	2
Halargyreus	1	1
Laemonema	18	2
Lepidion	9	3
Lotella	4	-
Momonatira	2	-
Mora	1	1
*Paralaemonema***	3	-
Physiculus	31	2
Pseudophycis	3	3
*Rhynchogadus **	?	-
Salilota	2	1
Tripterophycis	2	1

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* A problematic name, either based on early life history stages and not yet linked with known adults, or a neotenic form. If any of these genera are valid, it is not possible to say how many species might be in each

** Described too recently (Trunov, 1990) for further treatment herein.

Antimora Günther, 1878

MOR Ant

Genus with Reference : *Antimora* Günther, 1878, Ann.Mag.Nat.Hist., (5)2:18.

Diagnostic Features : Body shape variable, depending on condition; from notably robust to relatively elongate. Snout depressed to form a broadly V-shaped plate. No ventral light organs. Chin barbel present. Eye diameter less than postorbital length of head. Vomerine teeth present. Gill rakers short and stubby. First dorsal fin with five or more rays, the anterior one elongated; anal fin originating past midpoint of body, deeply indented at midlength; pectoral falling far short of anal fin origin, pelvic fins with six rays, one moderately elongated. Colour variable, ranging from nearly black to grey or bluish.

Habitat, Distribution and Biology : The two species of the genus are widely distributed in temperate and subantarctic waters of the world's oceans, from about 350 to more than 3000 m depth, but they have not been generally found in the deep waters of tropical seas. Their depth distributions tend to be shallower at higher latitudes. They are benthopelagic, and in many areas are among the most abundant fishes on the middle and deep slopes. Males attain a smaller size than females, the former rarely exceeding 40 cm, the latter sometimes growing to beyond 65 cm. The sexes segregate to some extent by depth, with males normally concentrating at the shallow end of the depth spectrum; females span a greater range. This segregation results in a smaller average size of individuals at the shallow end of the depth range, leading to the apparent phenomenon of "bigger-deeper". The life-history of these fishes is poorly known; although, there is evidence to suggest times and places of spawning in the western North Atlantic and the possible role of migration. Aspects of the biochemistry and physiology of these fishes have been extensively studied and have given us a better understanding of how deepsea animals cope with the low temperatures and high pressures of their environment through changes in metabolic pathways and physiological processes. Feeding habits are poorly known because of the usual eversion of the stomach caused by the expansion of the swimbladder when the fish are brought to the surface. Shrimps, amphipods and other free-swimming crustaceans, as well as small cephalopods and fish, probably form the bulk of the diet.

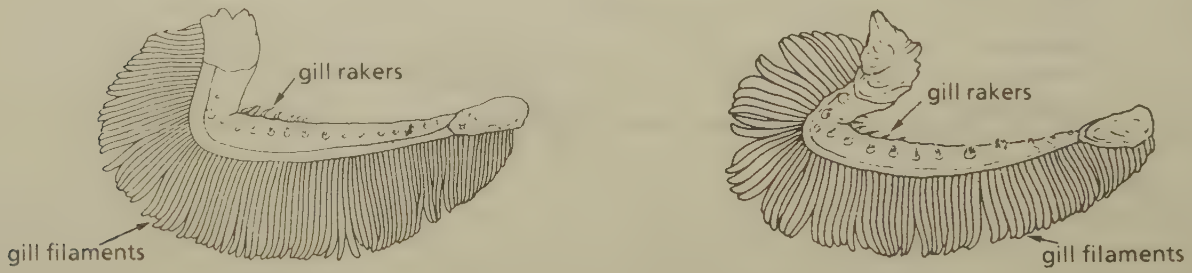
Interest to Fisheries : Currently of little significance to fisheries, although locally abundant in anti-tropical seas; they enter the bycatch of commercial trawl fisheries in several areas. The flesh is soft and watery and peak abundance of larger specimens is in deep water.

Remarks : In his review of the genus, Small (1981) recognized two species rather than six.

Key to species:

1a. Gill filaments on first arch relatively long, 93 to 103 (Fig.766a) .... ***A. microlepis*** Bean, 1890

1b. Gill filaments on first arch relatively short, 76 to 90 (Fig.766b) .... ***A. rostrata*** (Günther, 1878)



a. *A. microlepis*

b. *A. rostrata*

first gill arch
(from Small, 1981)

Fig. 766

Antimora microlepis Bean, 1890

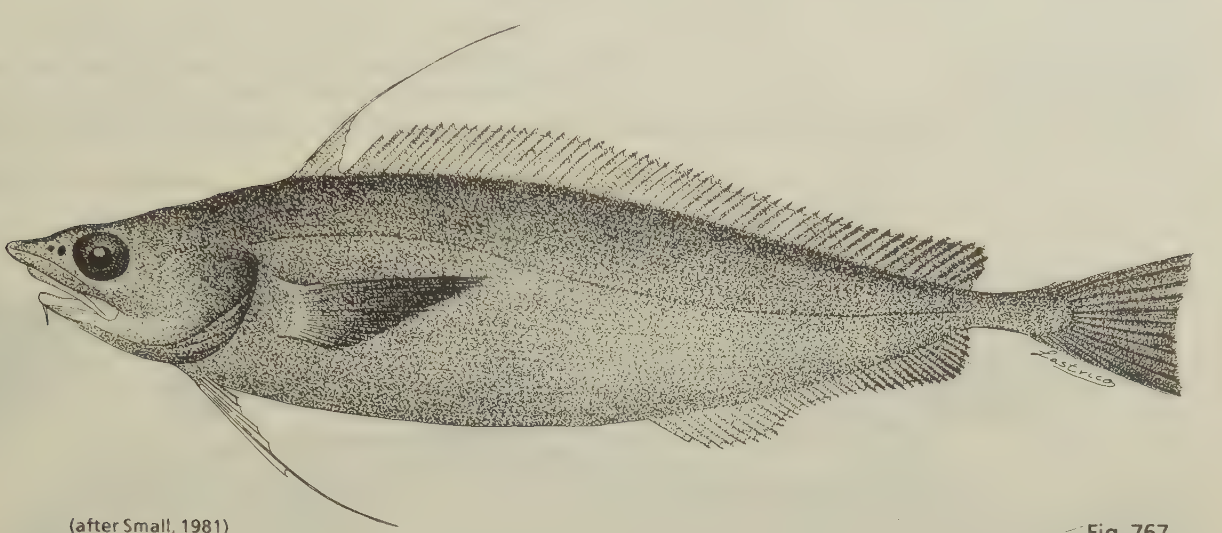
Fig. 767

MOR Ant 2

Scientific Name with Reference : ***Antimora microlepis*** Bean, 1890, Proc.U.S.Nat.Mus., 13:38.

Synonyms : None.

FAO Names : **En** - Finescale antimora.



(after Small, 1981)

Fig. 767

Diagnostic Features : Gill filaments on first arch 93 to 103.

Geographical Distribution : Eastern and western North Pacific, north of latitude 10°N at suitable depths including the tropical mid-Pacific, the Bering, Okhotsk and Kamchatka Seas, and Japan (Fig. 768).

Habitat and Biology : Benthopelagic in depths of about 510 to 2 800 m or more. Detailed life-history studies of the species has not been done as they have for ***A. rostrata*** along the United States east coast. It appears that sex segregation is also basic to this species, but whether or not the species migrates extensively or uses the North American west coast slopes only as feeding areas is not known.

Size : 65 cm total length or larger.

Interest to Fisheries : On the Canadian and United States Pacific coasts the species is frequently taken by trawlers fishing deep slope waters for Dover sole (***Microstomus pacificus***) and the deeper water species of rockfish (***Sebastes*** species). It is found in significant quantities in some areas, but so far as known is not utilized, probably because of its soft flesh and the relatively small average size usually taken.

Local Names : JAPAN: Sumidara; USA: Finescale codling.

Literature : Hart (1973); Iwamoto (1975); Small (1981).

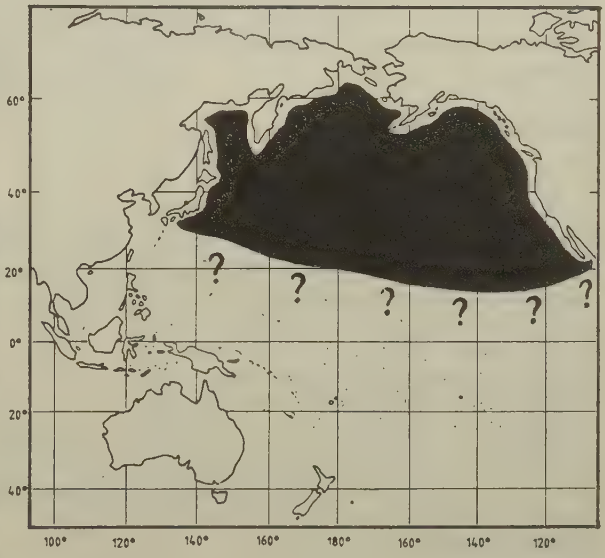


Fig. 768

Antimora rostrata (Günther, 1878)

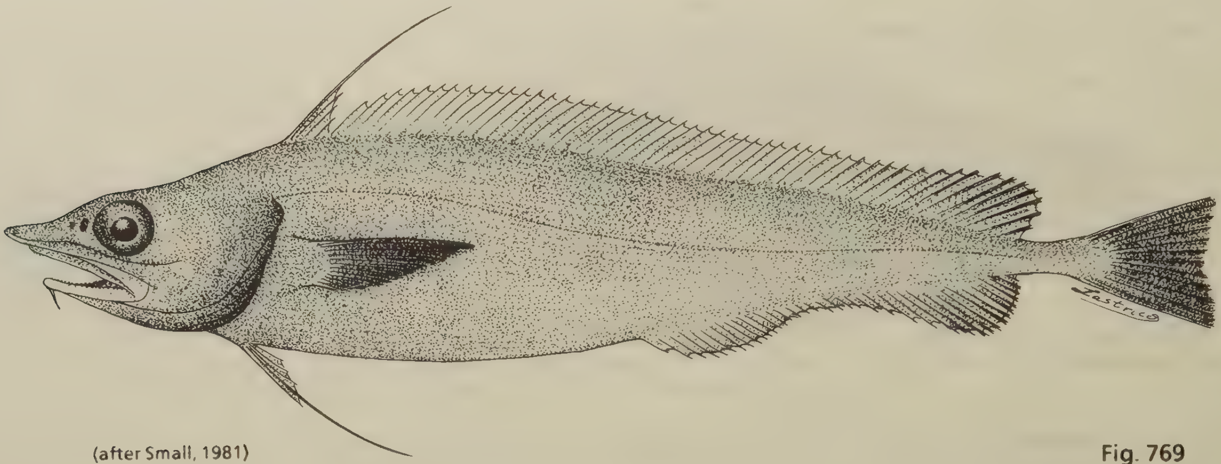
Fig. 769

MOR Ant 1

Scientific Name with Reference : ***Haloporphyrus* (*Antimora*) *rostratus*** Günther, 1878, Ann.Mag.nat.Hist., 5(2):18.

Synonyms : ***Haloporphyrus viola*** Goode & Bean, 1879; ***Antimora rhina*** Garman, 1899; ***Antimora australis*** Barnard, 1925; ***Antimora meadi*** Pequeño, 1970.

FAO Names : En - Blue antimora; **Fr** - Antimore bleu; **Sp** - Mollera azul.



(after Small, 1981)

Fig. 769

Diagnostic Features : Gill filaments on first arch 76 to 90.

Geographical Distribution : All oceans except the North Pacific north of 10°N (Fig. 770).

Habitat and Biology : Benthopelagic in about 350 to 3 000 m depth. May move offshore with age and spawn in the deep parts of its range. Off the eastern coast of the United States it is speculated that the population use the area only as feeding grounds with spawning taking place to the north.

Size : Reaching about 60 cm total length or larger.

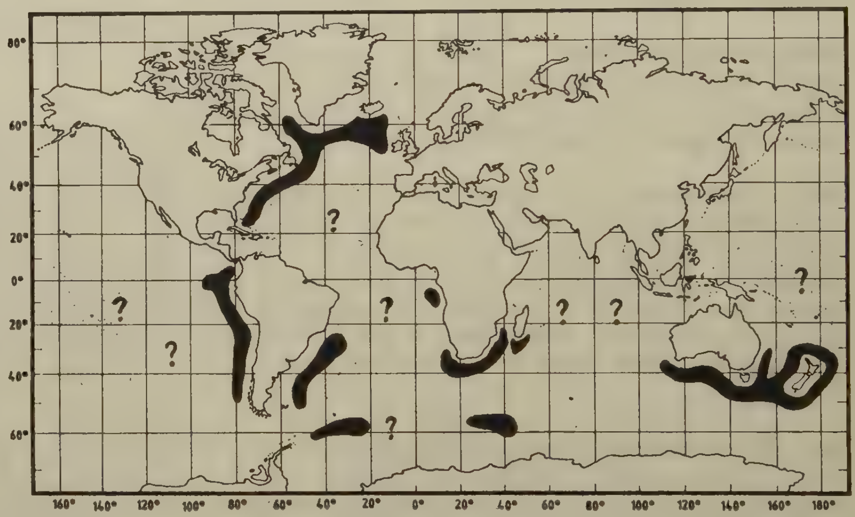


Fig. 770

Interest to Fisheries : The species is dominant in many temperate deep-slope communities between about 500 to 2 800 m depth. It is taken in the bycatch of trawlers and deep-set bottom longlines in many areas but so far as known, it is not utilized.

Local Names : USA: Blue hake; USSR: Antimora.

Literature : Iwamoto (1975); Wenner & Musick (1977); Small (1981).

Auchenoceros Günther, 1889

MOR Auch

Genus with Reference : *Auchenoceros* Günther, 1889 Challenger Rept., 78 (Zool.):24.

Remarks : A single species.

Auchenoceros punctatus (Hutton, 1873)

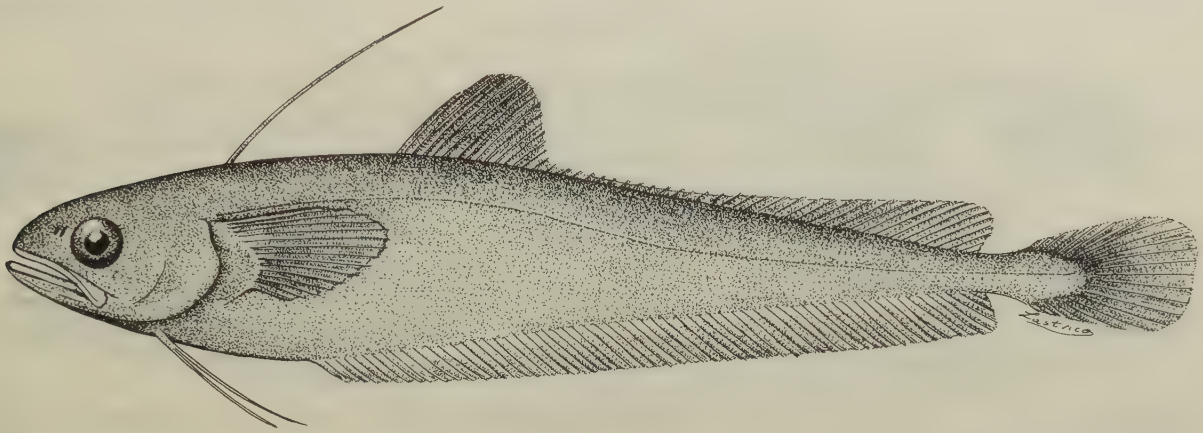
Fig. 771

MOR Auch 1

Scientific Name with Reference : *Calloptilum punctatum* Hutton, 1873, Trans.Proc.N.Z.Inst., 5:267.

Synonyms : *Bregmaceros punctatus*, Günther, 1876.

FAO Names : **En** - Ahuru.



(after Graham, 1956 and Paulin, 1983)

Fig. 771

Diagnostic Features : Chin barbel absent. First dorsal fin appearing as a single, elongate ray, widely separated from the second dorsal fin; second dorsal fin with very short rays at mid-length, sometimes appearing as two fins; anal fin long-based, not strongly indented, originating far forward on body, under the space between dorsal fins; pelvic fins with two rays. No ventral light organ. **Colour:** generally pale, variously reported as pink-tan with spots, silvery, and with a spot on side of head and a yellow lateral stripe.

Geographical Distribution : East coast of New Zealand from about 35° southward; also in the Cook Strait (Fig. 772).

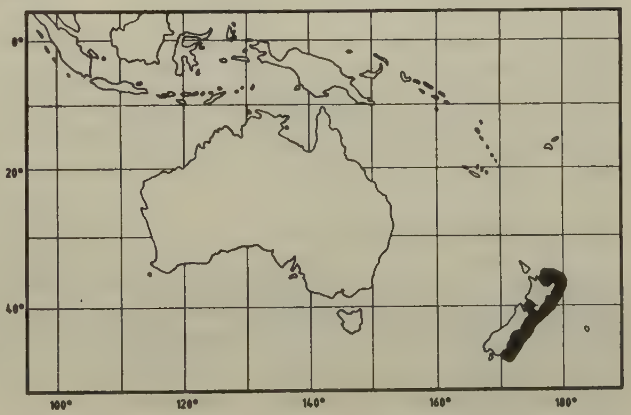


Fig. 772

Habitat and Biology : Apparently pelagic. Over sandy and muddy bottoms in inshore waters to depths of 420 m. Locally abundant, especially in the inner Hauraki Gulf and the Firth of Thames (New Zealand).

Size : Reaches about 13 cm total length, but more commonly 10 cm.

Interest to Fisheries : Not fished commercially at present, because of its small size. Possibly an important forage fish for commercial species.

Literature : Graham (1953); Paulin (1983).

Austrophycis Ogilby, 1897

MOR Aust

Genus with Reference : ***Austrophycis*** Ogilby, 1897, Proc.Linn.Soc.N.S.Wales, 22:90.

Remarks : So far as known, this genus includes a single species.

Austrophycis marginata (Günther, 1878)

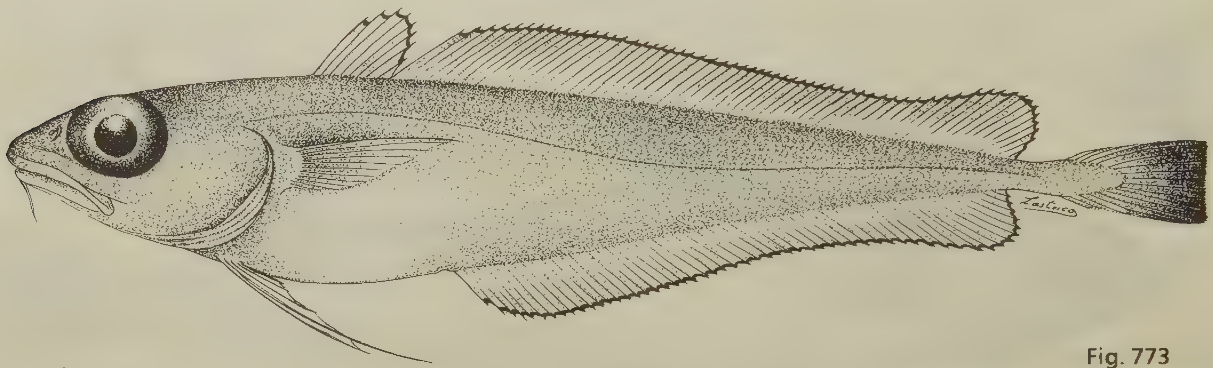
Fig. 773

MOR Aust 1

Scientific Name with Reference : ***Lotella marginata*** Günther, 1878, Ann.Mag.nat.Hist., (5)2:19.

Synonyms : ? ***Austrophycis megalops*** Ogilby, 1897; ***Physiculus marginatus***, Norman, 1937; ***Actuariolum*** sp. Fitch & Barker, 1972.

FAO Names : En - Dwarf codling.



(combined from Günther, 1887 and Nakamura, 1986)

Fig. 773

Diagnostic Features : Eye diameter equal to or greater than postorbital length of head. Interorbital space narrow, equal to or less than snout length; chin barbel present. First dorsal fin rays 8 to 10; anal fin long-based, originating on anterior half of body, below space between dorsal fins, not strongly indented; pelvic fins with 5 rays, the outer 2 somewhat elongated. **Colour:** pale pinkish; a dark spot at tip of first dorsal fin; caudal fin dusky distally.

Geographical Distribution : So far, found off Southern Patagonia along the Argentine slope to 40°S, and the Chilean coast to about 46°S, on the rises to the east and south of New Zealand, and off New South Wales and Tasmania (Fig. 774).

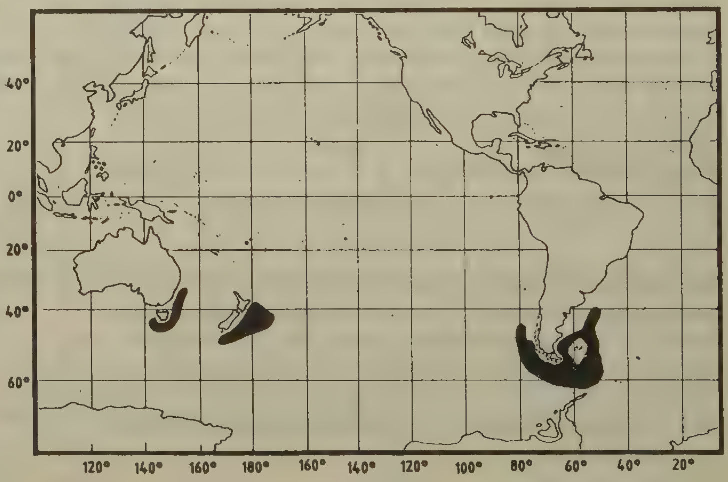


Fig. 774

Habitat and Biology : A benthopelagic species, apparently living from the inner shelf, in far southern South America, to depths beyond 1 000 m. According to Paulin (1983) possibly one of the most common morid species in the New Zealand Antarctic region in depths of 300 to 700 m.

Size : Maximum total length 24 cm.

Interest to Fisheries : None at present, but apparently sufficiently abundant to suggest potential as an industrial fish for reduction to fishmeal (Bellisio, López & Tomo, 1979; Paulin, 1983). In New Zealand not taken commercially because of its small size.

Local Names : ARGENTINA: Brotola, Pescada de ojo grande; NEW ZEALAND: Dwarf cod.

Literature : Bellisio, López & Tomo (1979); Paulin (1983); Nakamura (1986); Last, Scott & Talbot (1983).

Eeyorius Paulin, 1986

MOR Eey

Genus with Reference : ***Eeyorius*** Paulin, 1986, Mem.Mus.Victoria, 47:201

Remarks : A single species.

Eeyorius hutchinsi Paulin, 1986

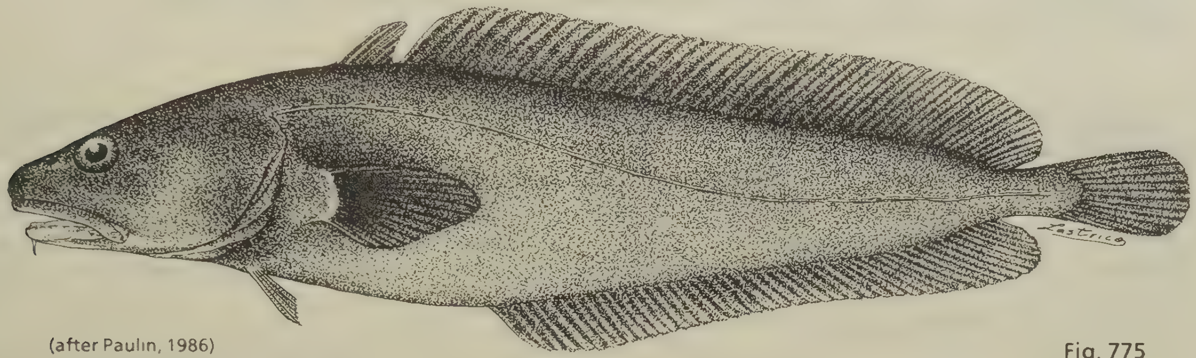
Fig. 775

MOR Eey 1

Scientific Name with Reference : ***Eeyorius hutchinsi*** Paulin, 1986, Mem.Mus.Victoria, 47:204

Synonyms : None

FAO Names : En - Tasmanian codling.



(after Paulin, 1986)

Fig. 775

Diagnostic Features : Chin barbel present. Jaw teeth in brush-like band; outer teeth of upper jaw only slightly larger than others; lower jaw teeth equal-sized. First dorsal fin with 6 rays, none greatly elongated; anal fin not greatly indented. No luminescent organ. Scales very small, about 20 in a transverse row betwen the lateral line and the first dorsal fin. Colour: in preservative, brownish grey, paler beneath head; fins uniformly brownish grey.

Geographical Distribution : Five localities in the Australian states of Western Australia, Victoria, Tasmania (Fig. 776).

Habitat and Biology : Captured at depths ranging from 7.5 to 12 m.

Size : Reaches 26 cm total length.

Interest to Fisheries : None at present.

Literature : Original description only.

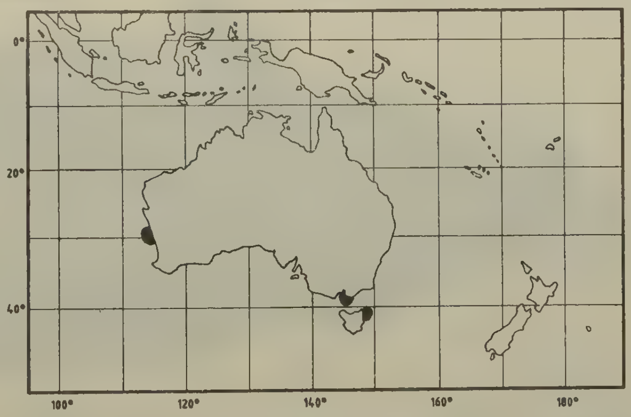


Fig. 776

Gadella Lowe, 1843

MOR Gadel

Genus with Reference : ***Gadella*** Lowe, 1843, Proc.Zool.Soc.London, 11:91.

Diagnostic Features : Chin barbel absent. First dorsal fin with 7 to 11 rays; anal fin long based, not greatly indented; pelvic fin with two outermost rays filamentous and slightly extended. Ventral light organ present.

Habitat, Distribution and Biology: Outer shelf to mid-slope depths in tropical and subtropical seas worldwide.

Interest to Fisheries : None.

Remarks : Recently revised by Paulin, 1989, who presents a key to the species.

List of species:

Gadella edelmanni (Brauer, 1908) - Western Indian Ocean off coast of Africa
Gadella filifer (Garman, 1899) - Galapagos region
Gadella imberbis (Vaillant, 1888) - Western Atlantic from Cape Cod to southern Brazil
Gadella jordani (Böhlke & Mead, 1951) - East coast of Japan and Kyushu-Palau Ridge
Gadella maraldi (Risso, 1810) - Mediterranean, Portugal, Madeira, Azores, Great Meteor Bank, northwest coast of Africa
Gadella molokaiensis Paulin, 1989 - Hawaiian Islands
Gadella norops Paulin, 1989 - New Zealand, Australia, Mascarene Ridge in western Indian Ocean
Gadella obscurus (Parin, 1985) - Nazca Ridge.

Gadella imberbis (Vaillant, 1888)

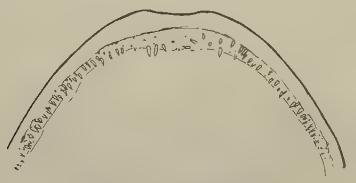
Fig. 777

MOR Gadel 1

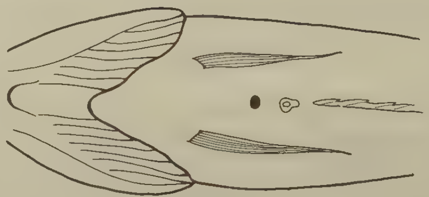
Scientific Name with Reference : ***Brosmiculus imberbis*** Vaillant, 1888, Exp.sci."Travailleur" et "Talisman", 1:293.

Synonyms : ***Uraleptus maraldi*** (not of Risso), Poll, 1953.

FAO Names : **En** - Beardless codling.



teeth in upper jaw



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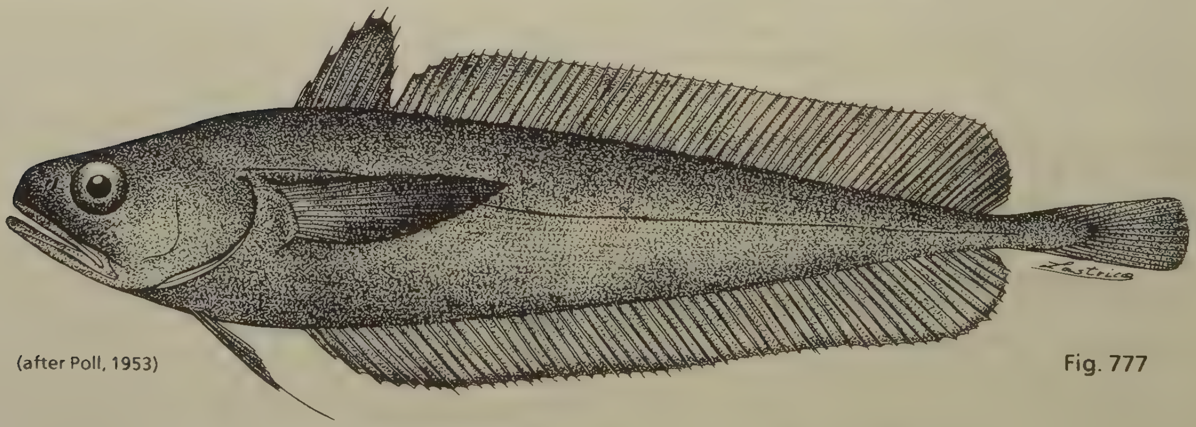


(after Poll, 1953)

Fig. 777

Diagnostic Features : Upper jaw teeth sometimes slightly larger in the outer part of band. Anal fin originating on anterior third of body under front part of first dorsal fin. Pectoral fins extending far past anal fin origin; filamentous ray of pelvic fins extending slightly beyond anal fin origin. **Colour** : dark; dark, anchor-shaped pigment pattern on roof of mouth.

Geographical Distribution : Rather widespread in the Caribbean and tròpical western Atlantic, apparently more restricted in the tropical eastern Atlantic, where it is found from the Cape Verde Islands to about 11°S (Fig. 778).

Habitat and Biology : Benthopelagic on the upper slope. Often rather abundant.

Size : Maximum total length 23 cm, but rarely reaching more than about 18 cm.

Interest to Fisheries : Commonly taken as bycatch by deep-water shrimp trawlers in the western Atlantic; but apparently not utilized for food.

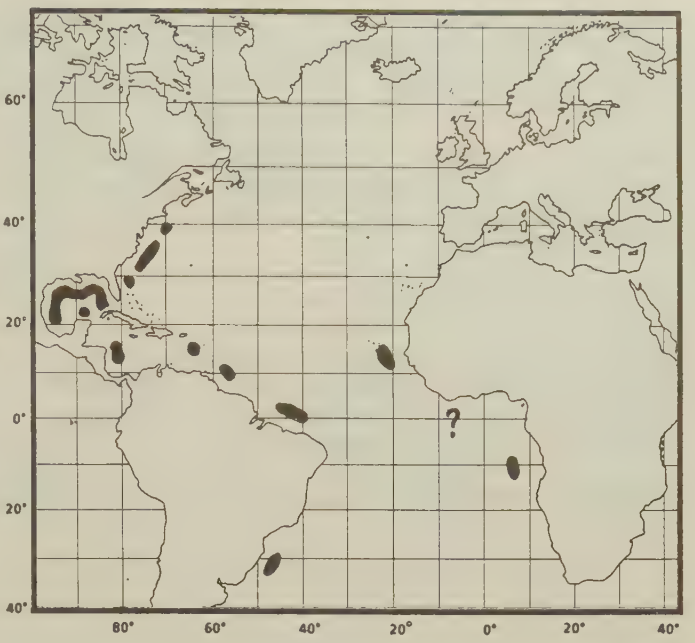


Fig. 778

Gadella maraldi (Risso, 1810)

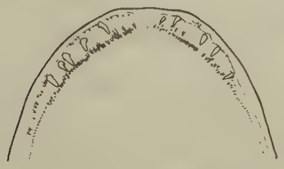
Fig. 779

MOR Gadel 2

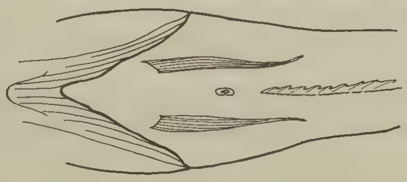
Scientific Name with Reference : ***Gadus maraldi*** Risso, 1810, Ichth. Nice: 123.

Synonyms : ***Merluccius maraldi***, Risso, 1826; ***Merluccius attenuatus*** Cocco, 1829; ***Strinsia tinca*** (not of Rafinesque), Bonaparte, 1832; ***Merluccius ambiguous*** Lowe, 1840; ***Uraleptus maraldi***, Costa, 1849; ***Merlucius uraleptus*** Costa, 1849.

FAO Names : En - Gadella.



teeth in upper jaw



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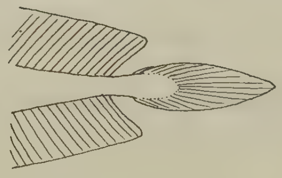
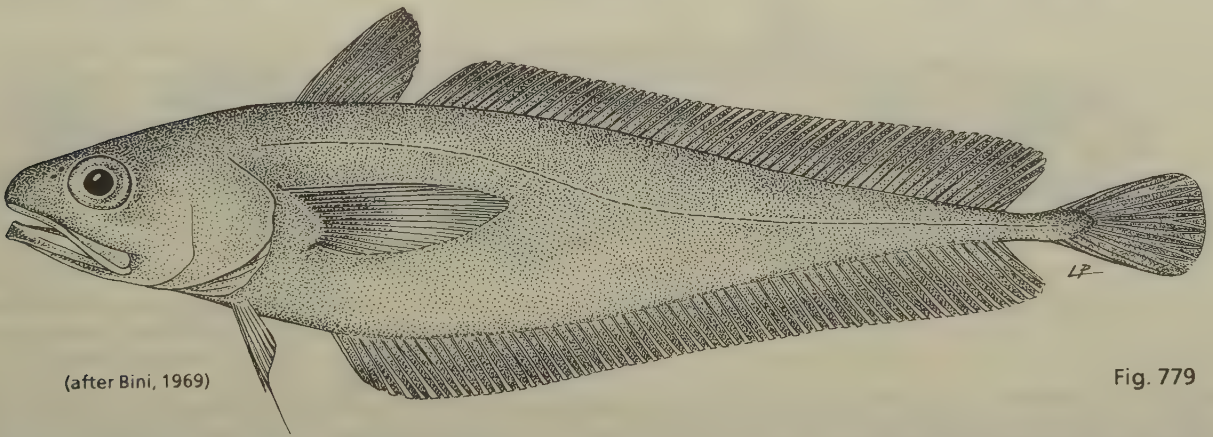


caudal fin in juveniles



(after Bini, 1969)

Fig. 779

Diagnostic Features : Upper jaw with two rows of teeth, the outer one with small teeth interspersed with notably large ones; the inner one with small teeth only. Anal fin originating on anterior third of body, under front part of first dorsal fin; pectoral fins extending far past anal fin origin; filamentous ray of pelvic fin extending slightly beyond anal fin origin. **Colour:** generally dark, oral cavity pale.

Geographical Distribution : Found throughout the Mediterranean, off Portugal, at Madeira, the Azores and the Great Meteor Bank. Its southern distribution along the west coast of Africa is not clear (Fig. 780).

Habitat and Biology : A benthopelagic species ranging from 150 to at least 700 m depth. Spawning takes place in spring and the first maturity is attained at 15 cm total length.

Size : Maximum total length 30 cm.

Interest to Fisheries : No separate statistics, but taken as bycatch in fisheries operating bottom trawls, and bottom longlines. Found occasionally in markets, but not of significant commercial importance.

Literature : Bini (1969).

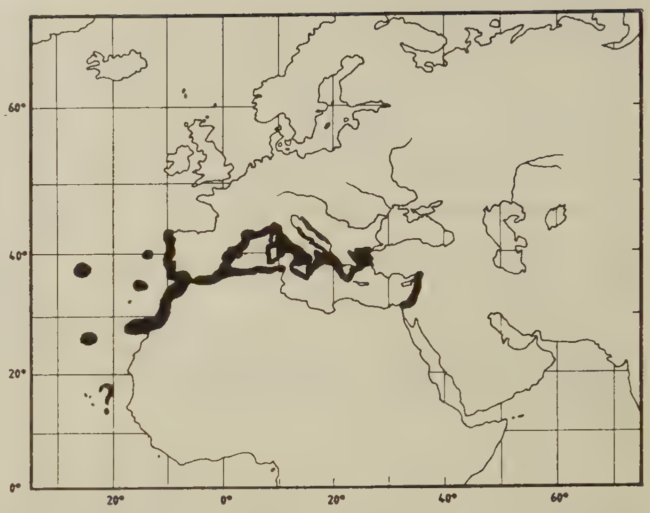


Fig. 780

Halargyreus Günther, 1862

MOR Hal

Genus with Reference : ***Halargyreus*** Günther, 1862, Cat.Fish.Brit.Mus., 4:342.

Remarks : This genus includes a single species according to Cohen, 1973.

Halargyreus johnsonii Günther, 1862

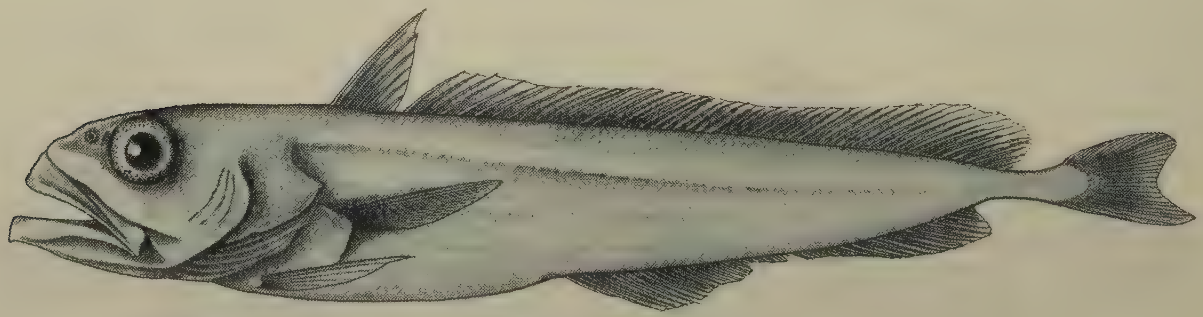
Fig. 781

MOR Hal 1

Scientific Name with Reference : ***Halargyreus johnsonii*** Günther, 1862, Cat.Fish.Brit.Mus., 4:342.

Synonyms : ***Halargyreus brevipes*** Vaillant, 1888; ***Halargyreus affinis*** Collett, 1904

FAO Names : **En** - Slender codling.



(from Cohen, 1973)

Fig. 781

Diagnostic Features : Eye diameter about equal to snout length, less than postorbital length of head. Lower jaw slightly projecting; no chin barbel. Jaw teeth finely granular; no teeth on vomer or palatines. First dorsal fin with 6 to 8 rays, none greatly elongated; anal fin originating near mid-length of body, deeply indented; pectoral fins falling short of anal fin origin. Pelvic fins with 5 or 6 rays, none greatly elongated. Ventral light organ absent. **Colour:** generally pale, silvery in fresh specimen; orobranchial cavity black.

Geographical Distribution : Antitropical in the Atlantic and Pacific Oceans (Fig. 782); not yet caught in the eastern North Pacific.

Habitat and Biology : Benthopelagic to pelagic over the continental slope; from 700 to at least 1 400 m depth off southern New Zealand.

Size : Maximum total length 56 cm.

Interest to Fisheries : Locally abundant but apparently not fished for at present.

Local Names : NEW ZEALAND: Slender cod.

Literature : Recent references are summarized by Paulin (1983).

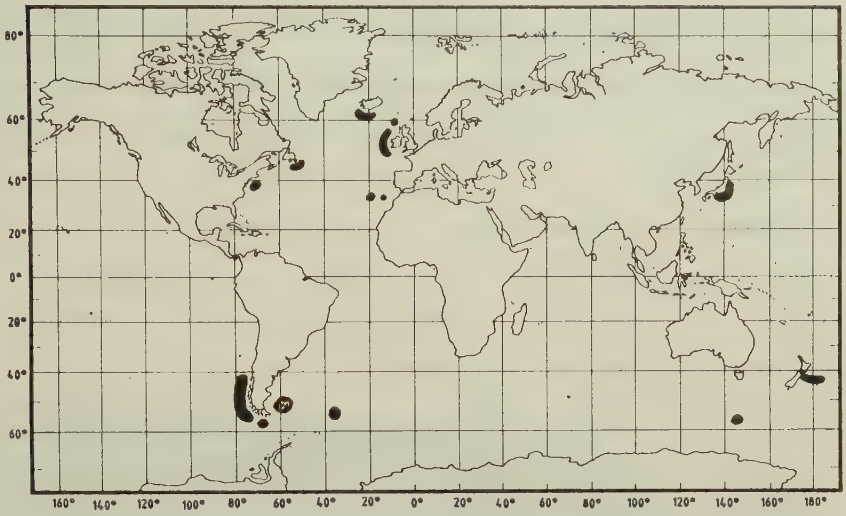


Fig. 782

Laemonema Johnson, 1862

MOR Laem

Genus with Reference : ***Laemonema*** Johnson, 1862, Proc.Zool.Soc.London, 1862:171.

Diagnostic Features : Two dorsal fins, the first short based, the second and the single anal fin with long bases; anal fin not greatly indented; pelvic fins with two long rays in each; no luminescent organs.

Habitat, Distribution and Biology : Benthopelagic on the continental slopes of the tropical to subtropical seas throughout the world. A few species are found at higher latitudes.

Interest to Fisheries : Not exploited at present. Only ***L. longipes***, discussed below, is perhaps common enough and grows sufficiently large to be of potential interest.

Remarks : ***Laemonema*** is so poorly known taxonomically and many of the 18 or more species that have been referred to it at one time or another are so rare that the following list is only tentative. At least some of these species will be placed in other genera.

List of Species :

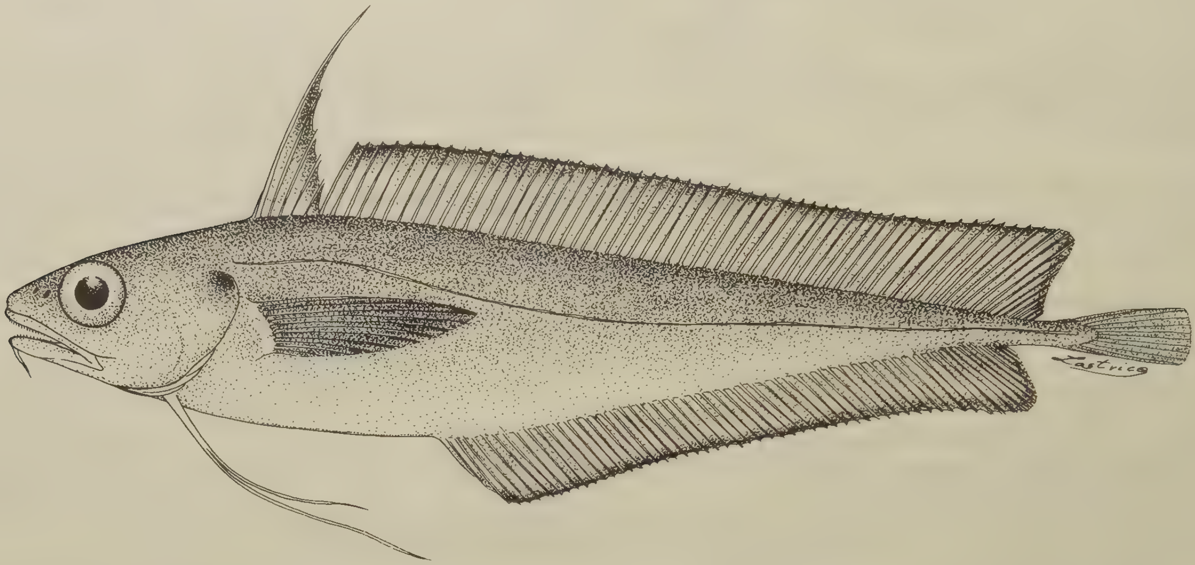
Laemonema barbatulum Goode & Bean, 1883 - Western Atlantic
Laemonema compressicauda (Gilchrist, 1903) - South Africa
Laemonema curtipes Biscoito & Maul, 1989 - Eastern Central Atlantic
Laemonema filodorsale Okamura, 1982 - Kyushu-Palau Ridge
Laemonema globiceps Gilchrist, 1906 - South Africa, New Zealand, Australia, Chile
Laemonema gracillipes Garman, 1899 - Eastern Pacific
Laemonema kongi Markle & Melendez, 1988 - Chile, Argentina, New Zealand
Laemonema latifrons Holt & Byrne, 1908 - N.E. Atlantic
Laemonema laureysi Poll, 1953 - Subtropical-Tropical eastern Atlantic
Laemonema longipes Schmidt, 1939 - Subarctic North Pacific, Bering Sea
Laemonema melanurum Goode & Bean, 1896 - Western Atlantic
Laemonema modesta (Franz, 1910) - Japan
Laemonema nana Taki, 1953 - Japan
Laemonema rhodochir Gilbert, 1905 - Central and western Pacific
Laemonema robustum Johnson, 1862 - Madeira
Laemonema verecunda (Gilbert, 1899) - Tropical eastern Pacific
Laemonema yarrellii Lowe, 1841 - Subtropical eastern North Atlantic
Laemonema yuvto Parin & Sazonov, 1990 - Southeastern Pacific

Laemonema laureysi Poll, 1953 Fig. 783 **MOR Laem 1**

Scientific Name with Reference : *Laemonema laureysi* Poll, 1953, Expéd.Océanogr.Belge Eaux Côt.Afric.Atl.Sud., 4(2):197.

Synonyms : None.

FAO Names : En - Guinean codling.



(after Poll, 1953)

Fig. 783

Diagnostic Features : Body depth 4.5 to 5.5 times in standard length. Eye diameter larger than snout, smaller than postorbital length; barbel present at tip of lower jaw, which is slightly shorter than upper. A moderately elongated filament in first dorsal fin; pectoral fins extending to rear level of anal fin origin. Scale rows between first dorsal fin and lateral line 10 to 12. **Colour :** generally light brown, paler ventrally.

Geographical Distribution : Tropical eastern Atlantic (Fig. 784).

Habitat and Biology : Benthopelagic on the outer shelf and upper slope at depths ranging from 220 to 500 m, most abundant around 300 m over soft bottom.

Size : Maximum total length 30 cm.

Interest to Fisheries : Locally abundant, but probably taken only as bycatch at present.

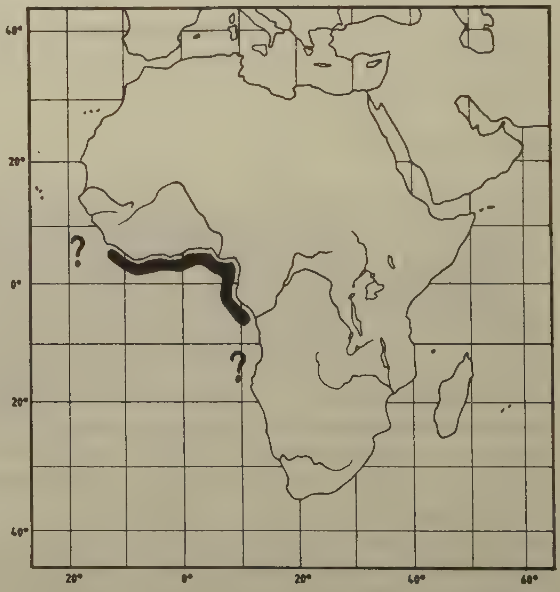


Fig. 784

Laemonema longipes Schmidt, 1938

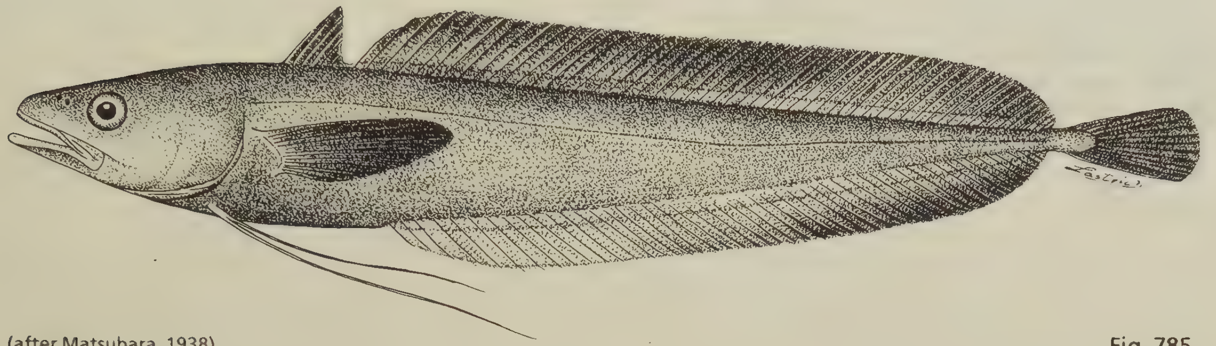
Fig. 785

MOR Laem 2

Scientific Name with Reference : ***Laemonema longipes*** Schmidt, 1938, Compt.Rend.Acad.Sci.URSS, 19:655.

Synonyms : ***Laemonema morosum*** Matsubara, 1938; ***Podonema longipes***, Rass, 1954; ***Podonematichthys longipes,*** Whitley, 1965.

FAO Names : **En** - Longfin codling.



(after Matsubara, 1938)

Fig. 785

Diagnostic Features : Body depth at anus about 7 or more times in standard length. Eye diameter less than snout and postorbital length of head. No barbel at tip of lower jaw, which is slightly longer than upper. No elongated filament in first dorsal fin; both pectoral and pelvic fins extending beyond origin of anal fin.

Geographical Distribution : Central Japan to the Okhotsk and Bering Seas (Fig. 786).

Habitat and Biology : Benthopelagic on the continental slope, from 455 to 1 400 m depth.

Size : Maximum total length 60 cm.

Interest to Fisheries : None at present. Locally abundant; many specimens taken from a whale stomach. Considered to be a promising potential resource. Experimental fishing has provided catch rates over 6 t/h off northern Japan (Amaoka, et al., 1983).

Local Names : JAPAN: Itohiki-dara.

Literature : Rass (1954); Matsubara (1955); Yabe, Cohen, Wakabyashi & Iwamoto (1981).

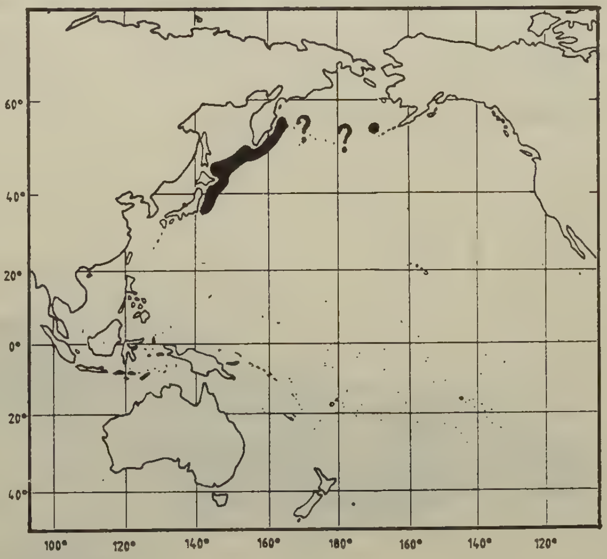


Fig. 786

Lepidion Swainson, 1838

MOR Lep

Genus with Reference : ***Lepidion*** Swainson, 1838, Nat.Hist.Fish.Amphib.Rept., 1:318.

Diagnostic Features : Chin barbel present. Jaw teeth granular, a patch of similar teeth present on vomer. First dorsal fin with five or more rays, one notably elongated; anal fin deeply indented at mid-length, originating on anterior half of body, pelvic fin with 5 to 8 rays, one or more variously elongated. Ventral light organ absent.

Habitat, Distribution and Biology : Benthopelagic fishes living on the continental slope and lower rise. Neither their taxonomy nor biology are well known. An outdated key is presented by Norman (1935). There may be a dozen or more species.

Interest to Fisheries : Marginal at present, but several species are locally abundant in deep water and may represent resources of potential interest.

Tentative List of Species :

Lepidion capensis Gilchrist, 1922 - South Africa
Lepidion ensiferus (Günther, 1887) - Temperate eastern South Atlantic
Lepidion eques (Günther, 1887) - Temperate North Atlantic
Lepidion guentheri (Giglioli, 1880) - Eastern North Atlantic
Lepidion inosimae (Günther, 1887) - Japan
Lepidion lepidion (Risso, 1810) - Mediterranean
Lepidion microcephalus Cowper, 1956 - Tasmania, New Zealand
Lepidion natalensis Gilchrist, 1922 - South Africa
Lepidion schmidti Svetovidov, 1936 - Japan, eastern Atlantic.

Lepidion ensiferus (Günther, 1887)

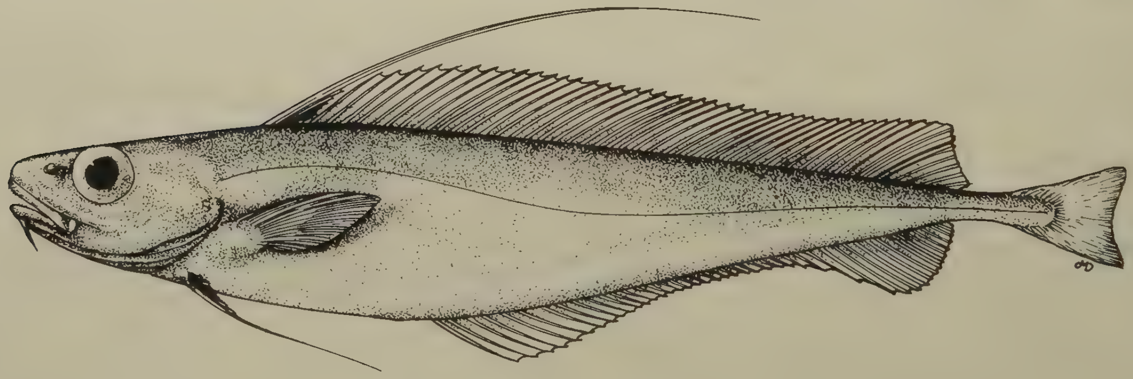
Fig. 787

MOR Lep 1

Scientific Name with Reference : ***Haloporphyrus ensiferus*** Günther, 1887, Challenger Repts., Zool., 22:92.

Synonyms : None.

FAO Names : En - Patagonian codling.



(after Günther, 1887)

Fig. 787

Diagnostic Features : Posterior nostril immediately anterior to eye; orbit diameter 2.7 to 3.3 times in head length. Second dorsal fin rays 50 to 56; anal fin rays 45 to 49. Lateral line system on head with pores. Pyloric caeca about 10.

Geographical Distribution : So far as known from about 39° to 55°S along the east coast of South America (Fig. 788).

Habitat and Biology : Benthopelagic on the upper slope.

Size : Maximum total length nearly 40 cm.

Interest to Fisheries : No fishery at present, may have some potential as an industrial fish.

Literature : Bellisio, López & Tomo (1979) as ***Lepidion engiferus***, a misspelling; Nakamura (1986).

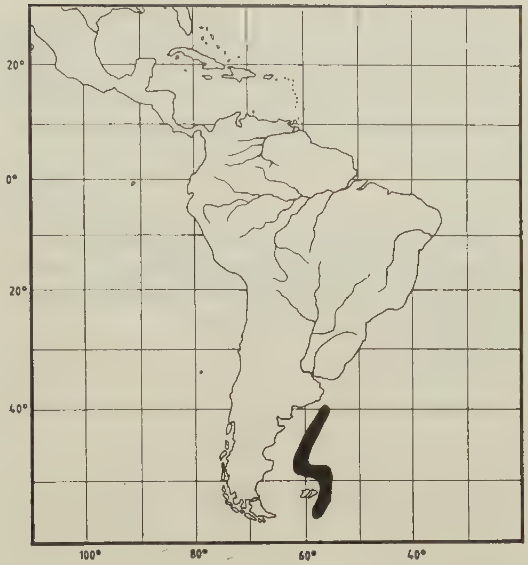


Fig. 788

Lepidion eques (Günther, 1887)

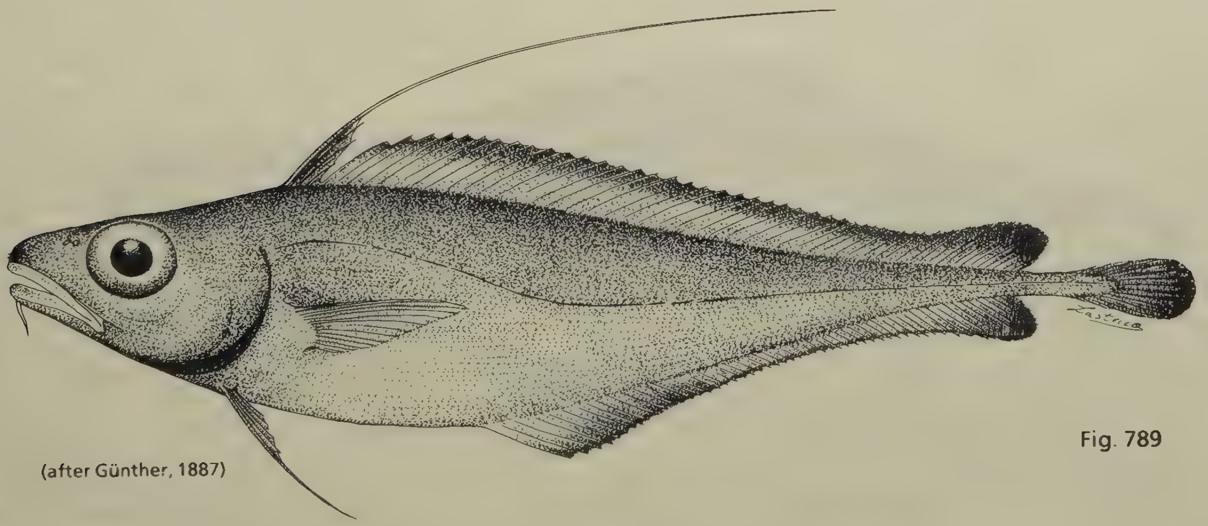
Fig. 789

MOR Lep 2

Scientific Name with Reference : ***Haloporphyrus eques*** Günther, 1887, Challenger Repts., Zool., 22:91.

Synonyms : None.

FAO Names : **En** - North Atlantic codling.



(after Günther, 1887)

Fig. 789

Diagnostic Features : Posterior nostril immediately anterior to eye; orbit diameter 2.6 to 3.1 times in head length. Second dorsal fin rays 55 to 60; anal fin rays 50 to 54. Lateral line system on head with pit organs but no pores. Pyloric caeca 8 to 13.

Geographical Distribution : Bay of Biscay, along the western slopes of the British Isles, along the Iceland- Faroe Ridge to Iceland, Greenland, Davis Straits, Northern Labrador and the Grand Banks of Labrador (Fig. 790). Rare in the western Atlantic.

Habitat and Biology : Benthopelágic between 127 and 1 850 m, with large fish living deeper. Feeds mainly on crustaceans but also on polychaetes. Caught singly but also in aggregations of more than 100 individuals.

Size : Maximum total length 44 cm.

Interest to Fisheries : None at present.

Literature : Templeman (1970).

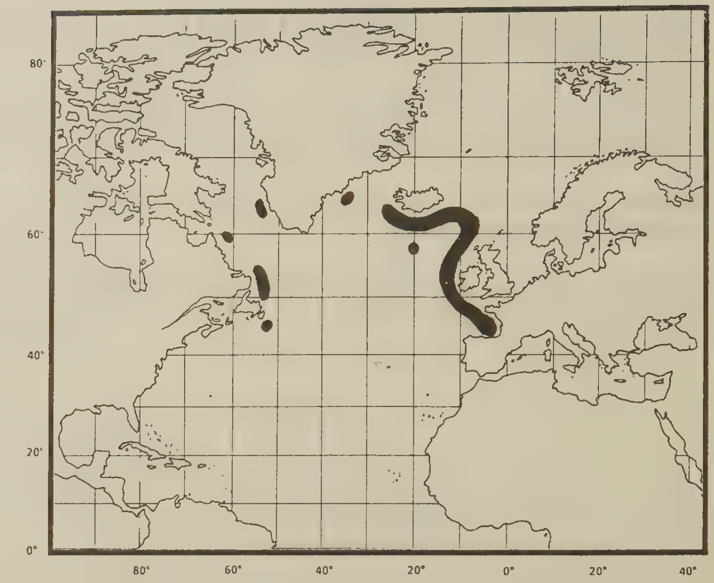


Fig. 790

Lepidion lepidion (Risso, 1810)

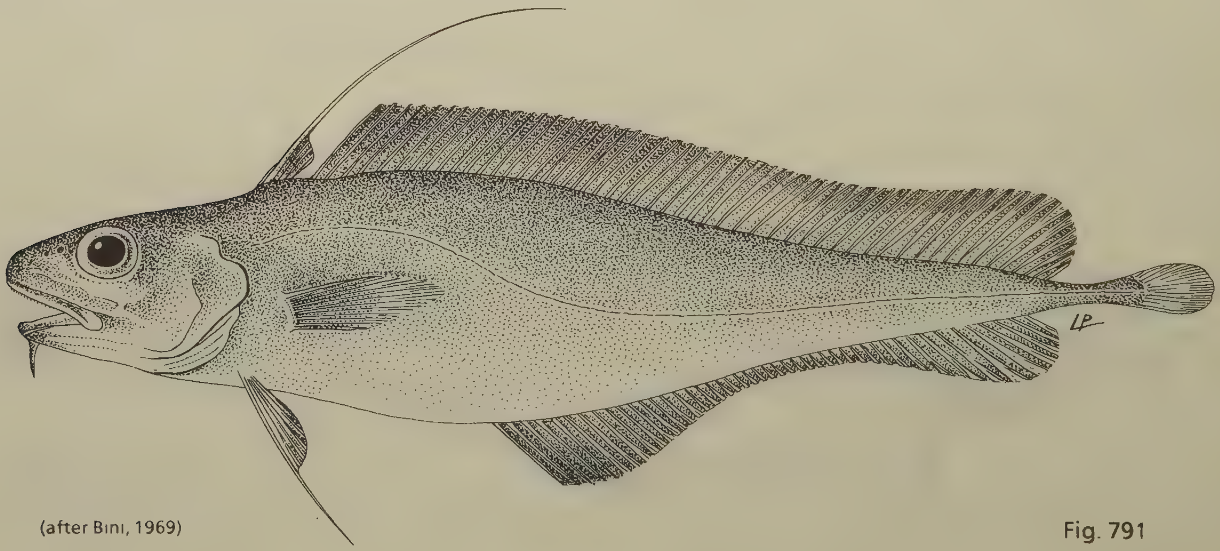
Fig. 791

MOR Lep 3

Scientific Name with Reference : ***Gadus lepidion*** Risso, 1810, Ichth.Nice:118

Synonyms : ***Lotta lepidion***, Risso, 1826; ***Lotta joptera*** Cocco, 1829; ***Lepidion rissoi*** Swainson, 1838; ***Lepidion rubescens*** Swainson, 1839; ***Haloporphyrus lepidion***, Canestrini, 1871.

FAO Names : **En** - Mediterranean codling.



(after Bini, 1969)

Fig. 791

Diagnostic Features : Posterior nostril immediately anterior to eye; orbit diameter 3.1 to 3.6 times in head length. Second dorsal fin rays 54 to 59; anal fin rays 48 to 51. Lateral line system on head with pit organs but no pores. Pyloric caeca 8 to 10.

Geographical Distribution : Northwestern Mediterranean (Fig. 792).

Habitat and Biology : Benthopelagic on the continental slopes from 500 to 2 230 m depth, most abundant deeper than 750 m. Feeds mainly on benthic organisms.

Size : To 34 cm total length.

Interest to Fisheries : Locally abundant; taken in trawls and by longlines. Occasionally found in markets

Literature : Bini (1969); Templeman (1970).

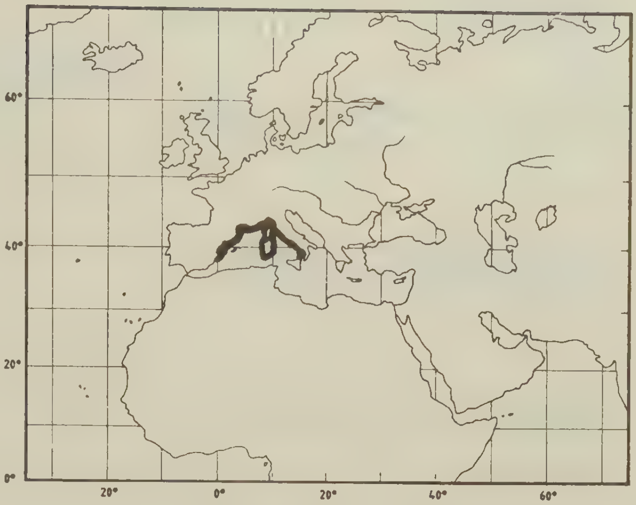


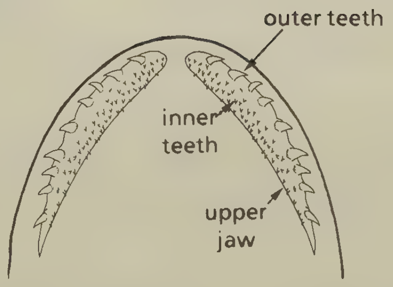
Fig. 792

Lotella Kaup, 1858

MOR Lot

Genus with Reference : *Lotella* Kaup, 1858, Arch.Naturgesch., 24:88.

Diagnostic Features : Chin barbel present; eye diameter less than postorbital length of head. Upper jaw with an outer row of relatively large, widely spaced, sharp-pointed teeth and an inner band of smaller teeth (Fig. 793). First dorsal fin with five or more rays, none greatly elongated; anal fin not greatly indented; pelvic fins with 6 to 9 rays, one or two slightly elongated. No luminescent organ. Scales very small, a dozen or more in a transverse row between the lateral line and the first dorsal fin (Fig. 794). **Colour:** dark brown to black.



teeth in upper jaw Fig. 793

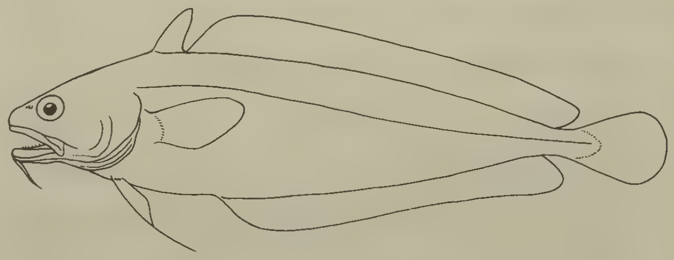
Habitat, Distribution and Biology : Found in Japan, New Zealand, temperate Australia and at Juan Fernandez Island, in shallow water on rough bottoms.

Size : These fishes reach total lengths of at least 25 cm.

Interest to Fisheries : Caught most often with hook and line, appearing only occasionally in fish markets.

Local Names : AUSTRALIA: Beardie; NEW ZEALAND: Rock cod.

Literature : Cohen (1979); Paulin (1983).



Lotella rhacinus Fig. 794

Remarks : About a dozen nominal species have been placed in *Lotella* at one time or another; however, the genus has never been revised, and it is neither possible to precisely identify the species nor to delimit their ranges. It is known that at least two species are found in Australia, two in New Zealand, two in Japan, and one at Juan Fernandez; however, the extent to which these regions share species, if in fact they do, is unknown.

Tentative distribution of some *Lotella* species:

Japan

Lotella phycis (Temminck & Schlegel, 1846)
Lotella tosaensis (Kamohara, 1936)

Australia

Lotella rhacinus (Bloch & Schneider, 1801)
Lotella phycis (Temminck & Schlegel, 1846)

New Zealand

Lotella rhacinus (Bloch & Schneider, 1801)
Lotella phycis (Temminck & Schlegel, 1846)

Juan Fernandez

Lotella fernandeziana Rendahl, 1921

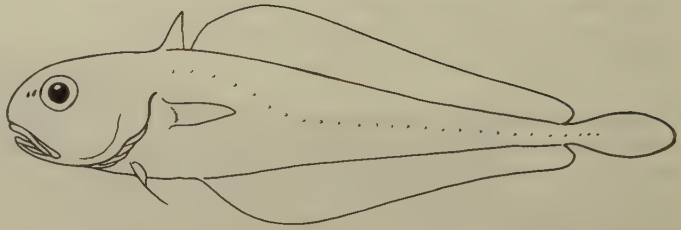
Momonatira Paulin, 1985

MOR Mom

Genus with Reference : ***Momonatira*** Paulin, 1985, N.Zeal.J.Zool., 12:357

Diagnostic Features : Chin barbel lacking or very small; head swollen and globular; upper jaw longer than lower. Bases of dorsal and anal fins fleshy; pectoral fin rays 23 to 30; pelvic fin rays 4 to 6. No luminescent organ (Fig. 795). **Colour :** drab.

Habitat, Distribution and Biology : Rare fishes, known from a dozen specimens trawled at depths of 1 090 to 1 180 m off the east coast of New Zealand's South Island and from the temperate South Atlantic.



Momonatira paulini Fig. 795

Size : Reaches 21 cm total length.

Interest to Fisheries : None.

List of Species:

Momonatira globosus Paulin, 1985 - New Zealand
Momonatira paulini Trunov, 1989 - Temperate South Atlantic

Mora Risso, 1826

MOR Mor

Genus with Reference : ***Mora*** Risso, 1826, Hist.nat.Europ.Merid., 3:224.

Remarks : This genus apparently includes a single species.

Mora moro (Risso, 1810)

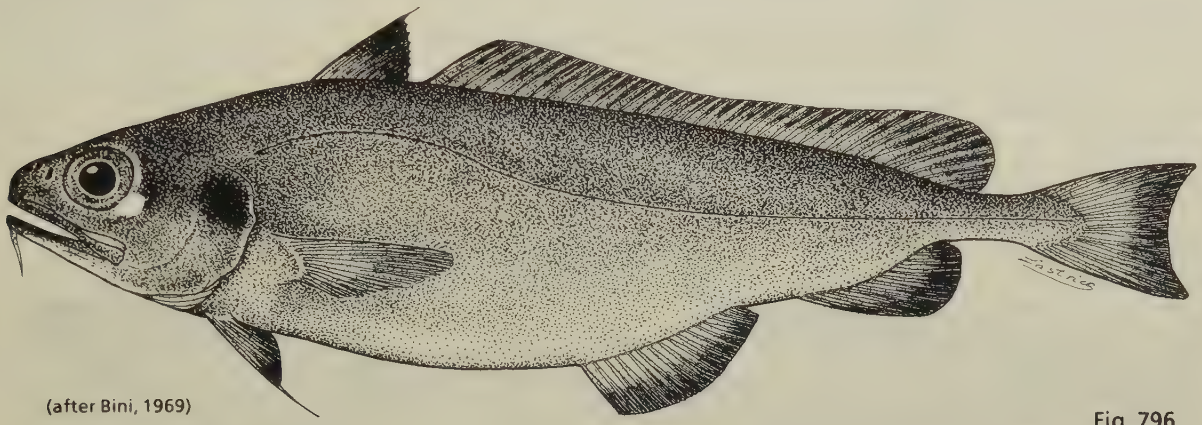
Fig. 796

MOR Mor 1

Scientific Name with Reference : ***Gadus moro*** Risso, 1810, Ichth.Nice:116.

Synonyms : ***Mora mediterranea*** Risso, 1826; ***Asellus canariensis*** Valenciennes, 1838; ***Mora pacifica*** Waite, 1914; ***Mora dannevigi*** Whitley, 1948.

FAO Names : **En** - Common mora; **Fr** - Moro commun; **Sp** - Mollera moranella.



(after Bini, 1969)

Fig. 796

Diagnostic Features : Eye diameter greater than snout length, shorter than postorbital length of head Chin barbel present. First dorsal fin with 7 to 11 rays, none greatly elongated; anal fin originating near mid-length of body, deeply indented at mid-length, sometimes appearing as two. Pectoral fin not reaching origin of anal fin, pelvic fins with 5 or 6 rays, one moderately elongated, not reaching anal fin origin. Ventral light organ absent. **Colour:** generally grey.

Geographical Distribution : In the Atlantic from Iceland and the Faeroes to Cape Bojador, West Africa, and including the Azores, Madeira, and the western Mediterranean; in the Indian Ocean south of Madagascar; in the Pacific known from temperate Australia, New Zealand, and from three catches of 10 specimens taken between Valparaiso, Chile and the Juan Fernandez Islands (Fig. 797).

Habitat and Biology : Benthopelagic from the outer continental shelf and slope most common between 500 and 800 m depth; occasionally found at 50 m. Spawning season in the Mediterranean probably in winter and early spring. A carnivore, feeding on fishes, crustaceans, molluscs and other invertebrates.

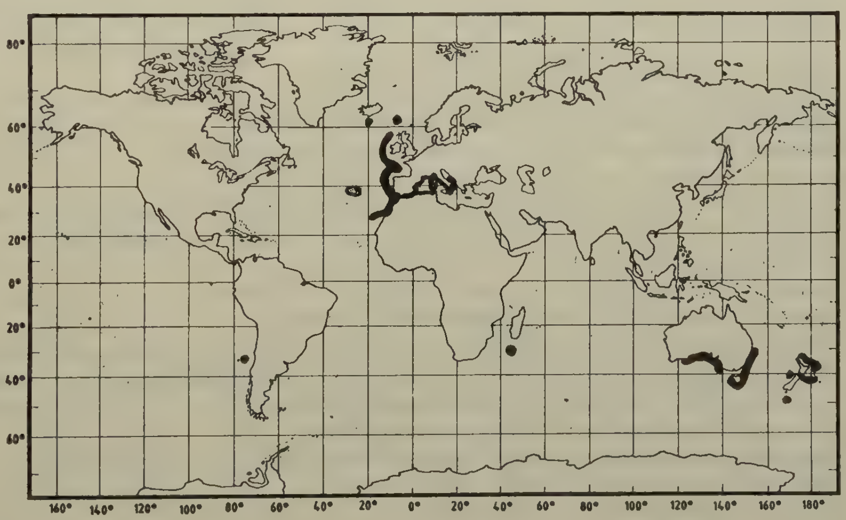


Fig. 797

Size : Reaches a total length of at least 56 cm.

Interest to Fisheries : Catch statistics for 1987 reported to FAO totalled 19 000 metric tons, mostly by USSR. Caught with trawls and longlines, marketed fresh. Only a small fishery exists and separate catch statistics are not recorded.

Local Names : AUSTRALIA: Deepsea cod, Ribaldo; FRANCE: Moro; ISRAEL: Gadela; ITALY: Moro; NEW ZEALAND: Deepsea cod, Googly-eyed cod, Ribaldo; PORTUGAL. Salmonete preto; TUNISIA: Ghrab; YUGOSLAVIA: Crnkinja.

Literature : Bini (1969); Paulin (1983).

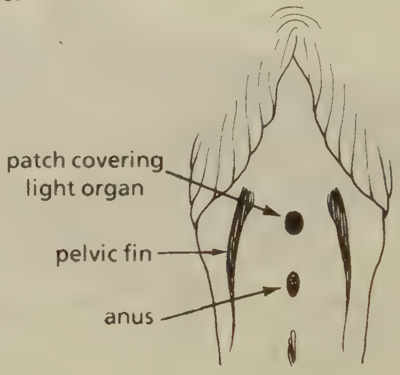
Remarks : Separate names have been given to New Zealand (***M. pacifica***) and Australia (***M. dannevigi***) populations. Paulin (1983) believes that all populations belong to a single species; however, a thorough comparison of specimens from all regions is required.

Physiculus Kaup, 1858

MOR Phys

Genus with Reference : ***Physiculus*** Kaup, 1858, Arch.Naturgesch., 24:88.

Diagnostic Features : Chin barbel present in most species; a single band of brush-like teeth in jaws; teeth absent from vomer and palatines. Two dorsal fins, the first short-based, the second long based and a single, long-based anal fin. First dorsal fin with 5 or more rays. Anal fin originating on anterior half of body, not indented. Pelvic fin rays 4 to 7. Ventral light organ present as a dark, scale-less patch between ventral fin bases, its precise position may vary in different species (Fig. 798). **Colour:** in the various species varies from black or blue-black to pale pink or scarlet.



ventral view Fig. 798

Habitat, Distribution and Biology : Benthopelagic; at least some species prefer a rough, rocky bottom. Various species occur at depths ranging from 2 or 3 m to over 1 500 m. Found throughout the world in tropical to temperate seas.

Interest to Fisheries : Minor, probably taken mostly by hook and line and in traps.

Remarks : There are 30 or more species of ***Physiculus.*** In a recent revision Paulin, 1989 presents a key.

Tentative list of *Physiculus* species :

Physiculus argyropastus Alcock, 1893 - Indian Ocean
Physiculus capensis Gilchrist, 1922 - South Africa
Physiculus chigodarana Paulin, 1989 - Kagoshima, Japan
Physiculus coheni Paulin, 1989 - Central Pacific, Christmas Island
Physiculus cynodon Sazonov, 1987 - Central Pacific
Physiculus dalwigkii Kaup, 1858 - Western Mediterranean, Subtropical N.E. Atlantic
Physiculus fulvus Bean, 1885 - Tropical western North Atlantic
Physiculus grinnelli Jordan & Jordan, 1922 - Hawaii
Physiculus helenaensis Paulin, 1989 - S. Atlantic, Saint Helena
Physiculus huloti Poll, 1953 - Tropical eastern Atlantic
Physiculus japonica Hilgendorf, 1879 - Japan, East China Sea
Physiculus karrerae Paulin, 1989 - Caribbean, Brazil, Saint Helena
Physiculus kaupi Poey, 1865 - Tropical western Atlantic
Physiculus longicavis Parin, 1984 - Southeast Pacific
Physiculus longifilis Weber, 1913 - Tropical Indo-Pacific
Physiculus luminosa Paulin, 1983 - New Zealand
Physiculus marisrubri Bruss, 1986 - Red Sea
Physiculus natalensis Gilchrist, 1922 - South Africa
Physiculus nematopus Gilbert, 1891 - Tropical eastern North Pacific
Physiculus nigrescens Smith & Radcliffe, 1912 - Tropical western Pacific

Physiculus nigripinnis Okamura, 1982 - Kyushu-Palau Ridge
Physiculus normani Bruss, 1986 - Western Indian Ocean
Physiculus peregrinus (Günther, 1871) - Tropical western Pacific
Physiculus rastrelliger Gilbert, 1891 - Tropical eastern North Pacific
Physiculus rhodopinnis Okamura, 1982 - Kyushu-Palau Ridge
Physiculus roseus Alcock, 1891 - Tropical Indo-Pacific
Physiculus sterops Paulin, 1989 - Hawaiian Islands
Physiculus sudanensis Paulin, 1989 - Western Indian Ocean
Physiculus talarae Hildebrand & Barton, 1949 - Eastern Pacific
Physiculus therosideros Paulin, 1987 - Southwest Pacific
Physiculus yoshidae Okamura, 1982 - Kyushu-Palau Ridge

Physiculus dalwigkii Kaup, 1858

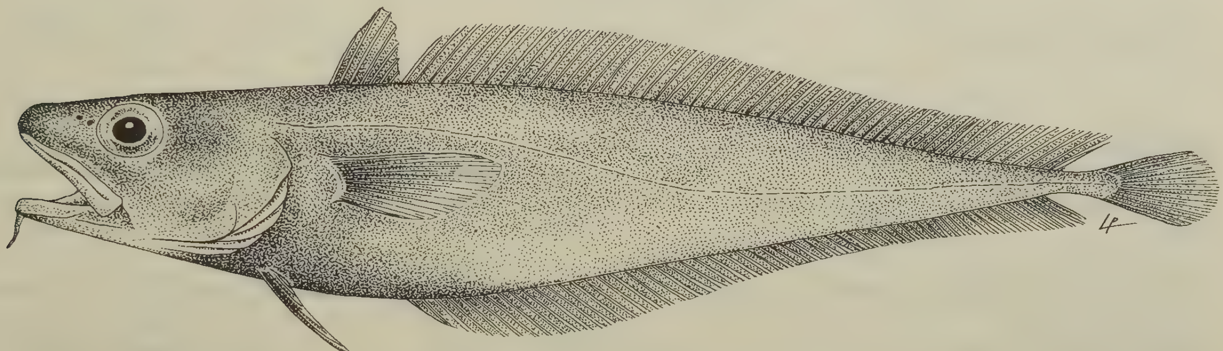
Fig. 799

MOR Phys 1

Scientific Name with Reference : ***Physiculus dalwigkii*** Kaup, 1858, Arch.Naturgesch., 24:88.

Synonyms : None

FAO Names : En - Black codling.



(after Bini, 1969)

Fig. 799

Diagnostic Features : Chin barbel present. No elongated rays in first dorsal fin; second dorsal fin rays 63 to 68; anal fin rays 66 to 75. Oblique scale rows between first dorsal fin and lateral line 11 to 13. Ventral light organ between bases of ventral fins. **Colour:** pinkish tan, oral cavity pale.

Geographical Distribution : Western Mediterranean, Madeira, Great Meteor Bank and south along the African coast to about 25°N(Fig. 800).

Habitat and Biology : Benthopelagic on the upper continental slope in about 100 to at least 300 m depth.

Size : Maximum total length about 30 cm.

Interest to Fisheries : Taken with bottom trawls and longlines, as bycatch of other fisheries. Occasionally seen in markets. Marketed mostly fresh.

Local Names : ITALY: Musdea nera; PORTUGAL: Abrotea de natura.

Literature : Bini (1969); Paulin (1989).

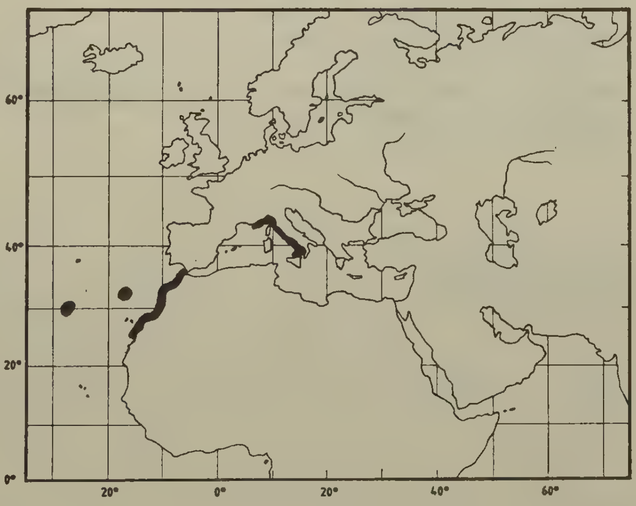


Fig. 800

Physiculus japonica Hilgendorf, 1879

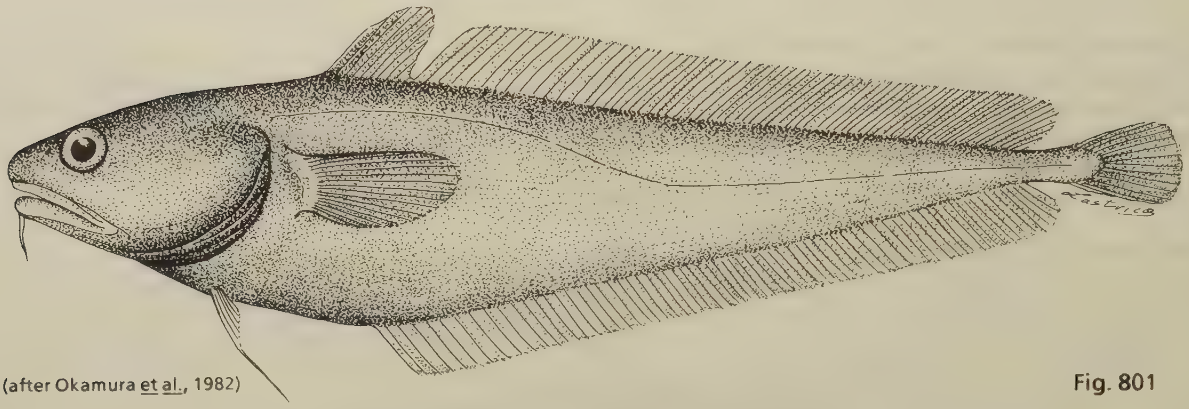
Fig. 801

MOR Phys 2

Scientific Name with Reference : ***Physiculus japonicus*** Hilgendorf, 1879, Sitz.Naturf Freunde, 80.

Synonyms : None.

FAO Names : En - Japanese codling.



(after Okamura et al., 1982)

Fig. 801

Diagnostic Features : Chin barbel present. No elongated rays in first dorsal fin; second dorsal fin rays 63 to 71; anal fin rays 63 to 78; 12 to 14 scale rows between the first dorsal fin and the lateral line. Ventral light organ well behind a line between ventral fins. Vertebrae 52 to 56. Head and body light brown to pinkish tan, shading to blue-black on belly.

Geographical Distribution : Japan (Fig. 802).

Habitat and Biology : On rough, rocky bottom along the continental shelf and upper slope in 150 to 350 m depth.

Size : Maximum total length at least 35 cm.

Interest to Fisheries : Sometimes taken by trawlers. Marketed fresh. No separate catch statistics are recorded Catches may contain more than one species.

Local Names : JAPAN: Chigodara.

Literature : Cohen (1979); Okamura et al. (1982); Masuda et al. (1984); Paulin (1989).

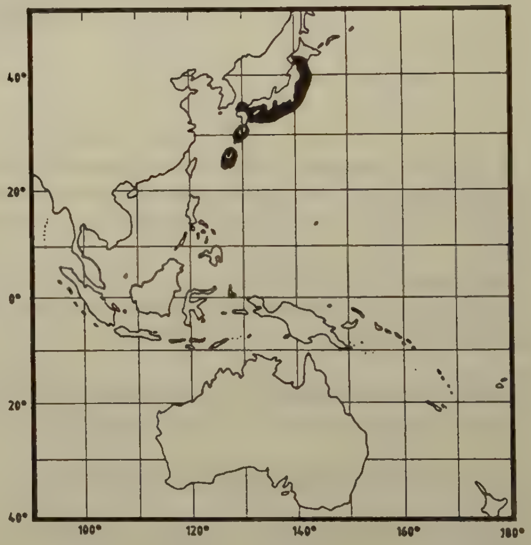


Fig. 802

Pseudophycis Günther, 1862

MOR Pseud

Genus with Reference : ***Pseudophycis*** Günther, 1862, Cat.Fish.Brit.Mus., 4:350.

Diagnostic Features : Eye diameter less than postorbital length of head. Chin barbel present. Jaw dentition a band of equal sized teeth. First dorsal fin with 8 to 14 rays, none greatly elongated; anal fin originating on anterior half of body, not greatly indented; pectoral fins reaching at least to origin of anal fin; pelvic fins with 5 or 6 rays, two somewhat elongated. Ventral light organ absent.

Habitat, Distribution and Biology : Benthopelagic on the continental shelf. Found around New Zealand and off Australia.

Size : From about 15 cm to over 1 m in total length.

Interest to Fisheries : Locally abundant and in some places a relatively important resource. Taken with trawls, seines, gillnets, and hook and line.

Remarks : Three valid species according to Paulin (1983), from which the following key is adapted

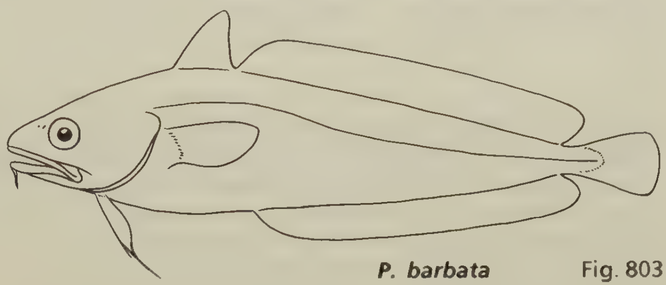
Key to species:

1a. Scales between lateral line and first dorsal fin 13 to 16; pyloric caeca 16 to 20 (Fig. 803) .... ***P. barbata***

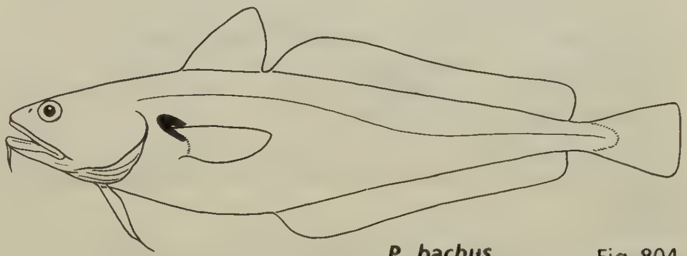
1b. Scales between lateral line and first dorsal fin 7 to 9; pyloric caeca 6 to 8

  2a. A dark blotch at base of pectoral fin; rear margin of caudal fin truncate (Fig. 804) .... ***P. bachus***

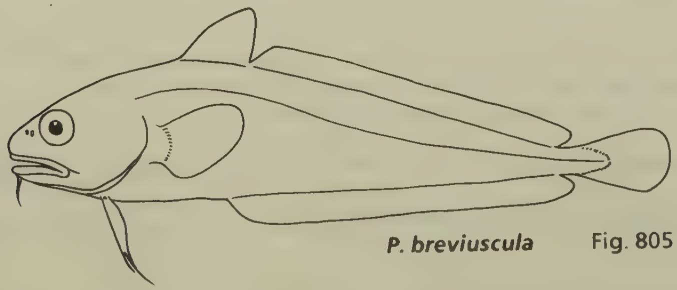
  2b. No dark blotch at base of pectoral fin; rear margin of caudal fin rounded (Fig. 805) .. ***P. breviuscula***



P. barbata Fig. 803



P. bachus Fig. 804



P. breviuscula Fig. 805

Pseudophycis bachus (Bloch & Schneider, 1801)

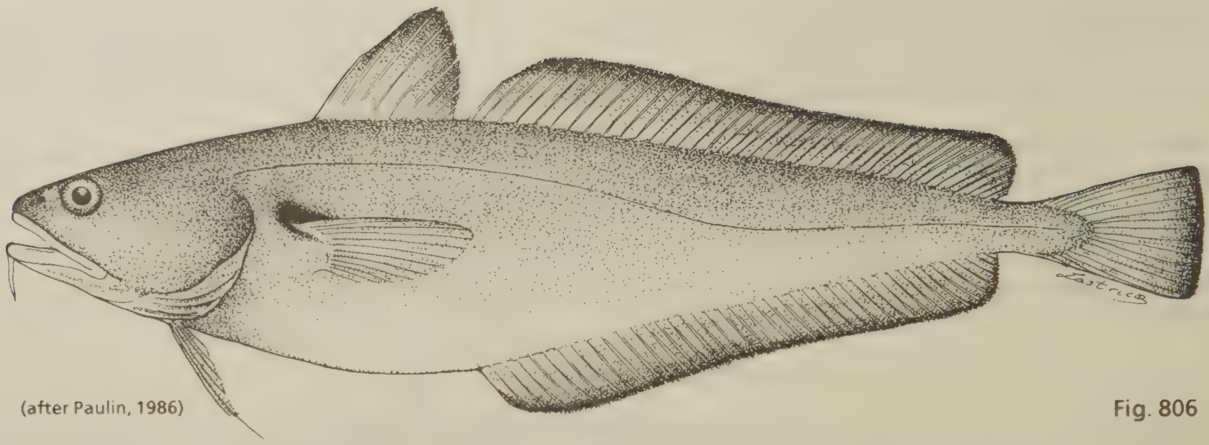
Fig. 806

MOR Pseud 1

Scientific Name with Reference : ***Enchelyopus bachus*** Bloch & Schneider, 1801, Syst.Ichth.:53.

Synonyms : ***Lotella bachus,*** Günther, 1862; ***Pseudophycis bacchus,*** Günther, 1880; ***Physiculus bachus,*** Waite, 1911; ***Physiculus (Pseudophycis) bachus,*** Graham, 1956.

FAO Names : En - Red codling.



(after Paulin, 1986)

Fig. 806

Diagnostic Features : Nostrils anterior to eye by about one-third of snout length. Rear margin of caudal fin truncate; scales in a transverse row between first dorsal and lateral line 7 to 9. Pyloric caeca 6 to 8. **Colour:** chiefly reddish pink shading to paler ventrally, vertical fins with dark margins; a dark blotch at base of pectoral fin.

Geographical Distribution : New Zealand and around Australia, at least from Sydney to Adelaide, and around Tasmania (Fig. 807).

Habitat and Biology : In New Zealand, usually on soft muddy or sandy bottoms at depths of 50 to about 550 m, but most abundant in 200 to 300 m along the edge of the continental shelf. A shallow-water population inhabits crevices and caves in rocky areas at depths less than 50 m. Spawning occurs in late winter over the outer continental shelf, with large females producing as much as 30 million eggs. The young grow to 22 cm after year one, 30 to 35 cm after year two, and about 50 cm after year four, when they become sexually mature. Feeds primarily on fishes, cephalopods, crabs and other crustaceans (Ayling & Cox, 1982).

Size : Reaches about 90 cm total length, but mostly smaller.

Interest to Fisheries : Trawled in New Zealand (Canterbury Bight and off Westland). For 1983 7 809 t were reported to FAO, down considerably from the 12 500 t taken in 1977. These figures may include ***P. barbata***, with which it has been confused for a long time in the fishery and in the literature.

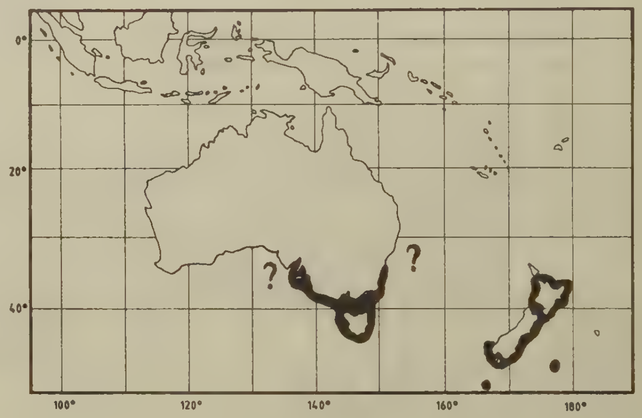


Fig. 807

Local Names : AUSTRALIA: Red cod; NEW ZEALAND: Hoka, Red cod.

Literature : Habib (1975); Ayling & Cox (1982); Paulin (1983, 1986).

Pseudophycis barbata Günther, 1863

Fig. 808

MOR Pseud 2

Scientific Name with Reference : ***Pseudophycis barbatus*** Günther, 1863, Ann.Mag.Nat.Hist., (3)11:116.

Synonyms : ***Lotella grandis*** Ramsay, 1881; ***Physiculus barbatus,*** McCulloch, 1929.

FAO Names : En - Southern bastard codling.

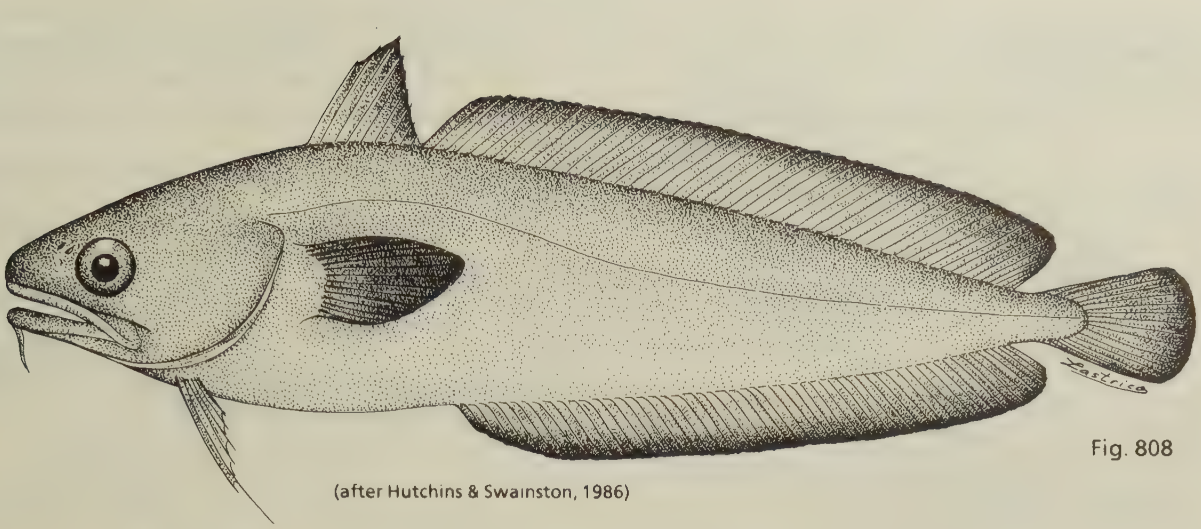


Fig. 808

(after Hutchins & Swainston, 1986)

Diagnostic Features : Nostrils immediately anterior to eye. Scales in a transverse row between first dorsal fin origin and lateral line 13 to 16. Pyloric caeca 16 to 20. **Colour:** reddish pink to pale brown dorsally, shading to lighter colour ventrally. Vertical fins with dark margins. No dark blotch at base of pectoral fin.

Geographical Distribution : Around New Zealand and Australia, from Sydney to Perth, although apparently rare in the west (Fig. 809).

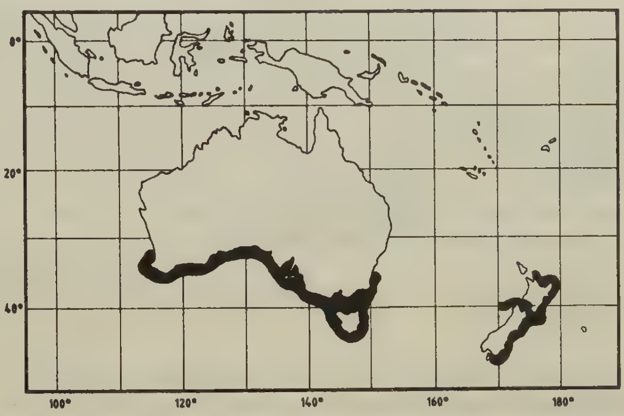


Fig. 809

Habitat and Biology : In New Zealand found on hard bottom at depths shallower than 300 m. Abundant in estuary mouths in New Zealand.

Size : Known to reach 63 cm total length.

Interest to Fisheries : Landed in New Zealand where potential for larger catches exists. Gillnetted in Tasmania. Occasionally appearing in the Melbourne market, taken from rock lobster pots. Separate catch statistics are not recorded, but the catch figures for ***P. bachus***, which totalled 7 809 t in 1983, doubtless also includes this species.

Local Names : AUSTRALIA: Bearded rock cod, Beardie, Cod; NEW ZEALAND: Bastard cod, Bastard red cod.

Literature : Graham (1956); Walker (1972); Paulin (1983).

Pseudophycis breviuscula (Richardson, 1846)

Fig. 810

MOR Pseud 3

Scientific Name with Reference : ***Lota breviuscula*** Richardson, 1846, Zool.Erebus and Terror, 2:61.

Synonyms : None.

FAO Names : **En** - Northern bastard codling

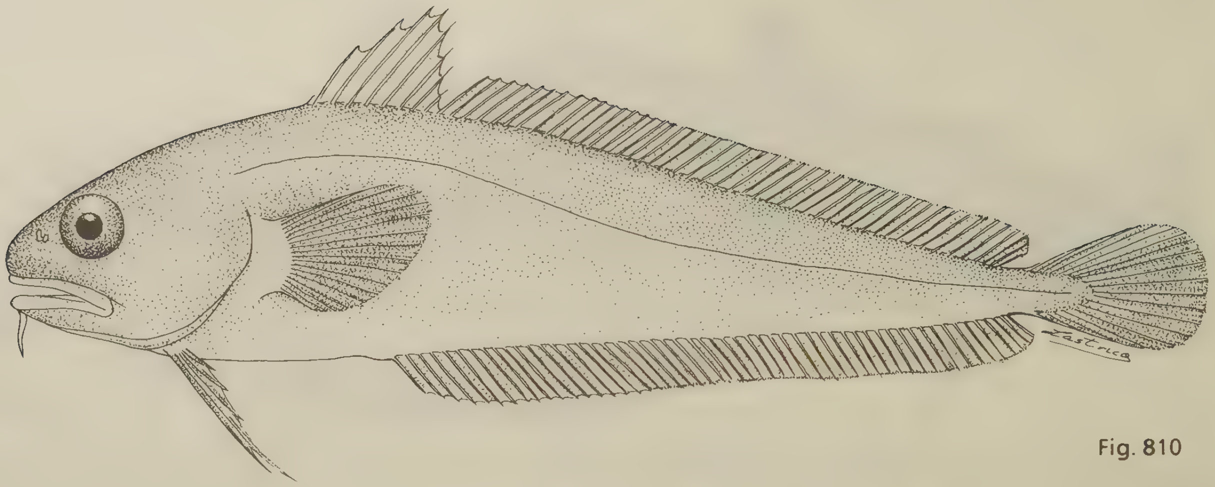


Fig. 810

Diagnostic Features : Caudal fin rounded. Scales in a transverse row between first dorsal fin origin and lateral line 6 to 8. Pyloric caeca 6 to 8. **Colour:** brown to pink-brown, paler ventrally; vertical fins with a dark margin. No dark blotch at base of pectoral fin.

Geographical Distribution : New Zealand, New South Wales to Southwest Australia, including Tasmania ,less common to the west(Fig. 811).

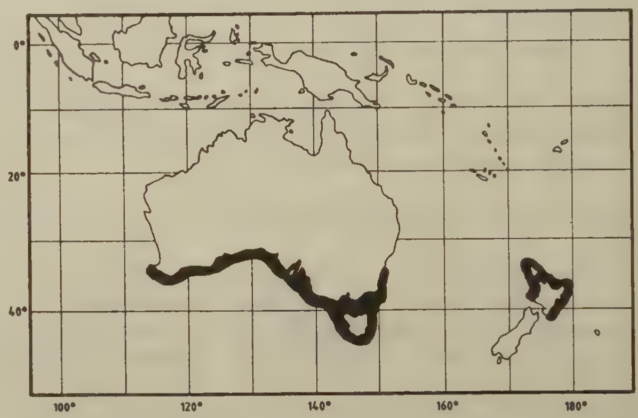


Fig. 811

Habitat and Biology : Benthopelagic over hard bottom. Caught at depths ranging from the shoreline to 220 m. Divers rarely see them during the day, but they are commonly observed at night swimming close to the bottom (Ayling & Cox, 1982).

Size : Maximum total length exceeding 25 m, but mostly smaller.

Interest to Fisheries : Although a common fish on the continental shelf, its relatively small size makes it of little interest to fisheries.

Local Names : NEW ZEALAND: Northern bastard red cod.

Literature : Paulin (1983).

Remarks : Although other references to the biology of this species exist, they should be used with care because of long-standing taxonomic confusion.

Salilota Günther, 1887

MOR Sal

Genus with Reference : ***Salilota*** Günther, 1887, Challenger Repts.Zool., 22:95.

Salilota australis (Günther, 1878)

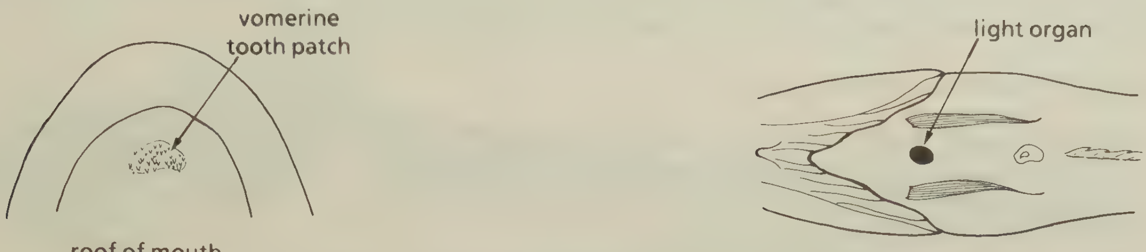
Fig. 812

MOR Sal 1

Scientific Name with Reference : ***Haloporphyrus australis*** Günther, 1878, Ann.Mag.Nat.Hist., (5)2:19

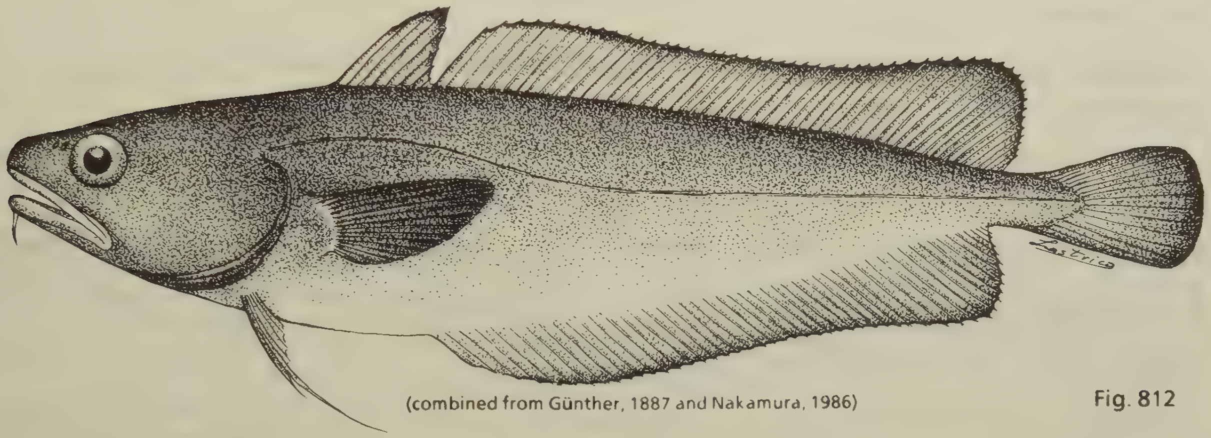
Synonyms : ***Salilota bovei*** Perugia, 1891.

FAO Names : **En** - Tadpole codling.



roof of mouth

underside



(combined from Günther, 1887 and Nakamura, 1986)

Fig. 812

Diagnostic Features : Eyes equal to or larger than snout, shorter than postorbital; chin barbel present; a small, variably shaped patch of teeth on head of vomer. First dorsal fin with 9 to 12 rays, none greatly elongated; anal fin long-based, originating close to anterior third of body, not indented; pectoral fins reaching beyond anal fin origin. Ventral light organ present. **Colour:** body uniformly brown, fin margins darker.

Geographical Distribution : Patagonia-Falkland/ Malvinas region from 40°S to 55°S. Straits of Magellan and southern Chile to 45°S (Fig. 813).

Habitat and Biology : Benthopelagic at depths from 40 to more than 1 000 m with highest catches at 235 m. Females attain larger sizes than males. Larger individuals of both sexes move into deeper water.

Size : Reaching at least 50 cm total length.

Interest to Fisheries : Presently fished; marketed fresh in Patagonia, and also exported as frozen filets, and reduced to fishmeal.

Local Names: ARGENTINA: Bacalao austral, Bacalao criollo, Brotola brava; CHILE: Renacuajo de mar.

Literature : Bellisio, Lopez & Tomo (1979); Nakamura (1986).

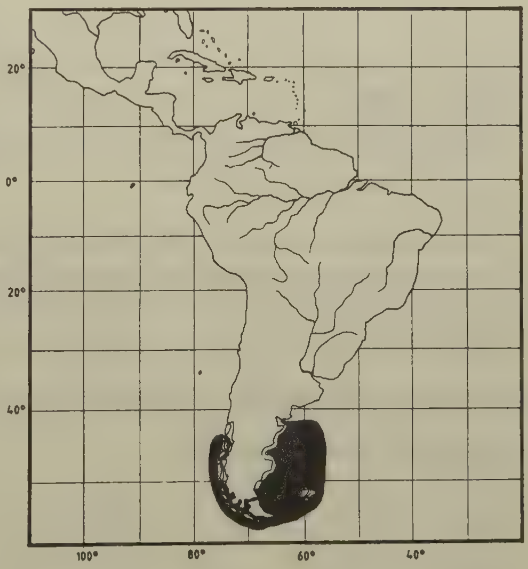


Fig. 813

Tripterophycis Boulenger, 1902

MOR Tript

Genus with Reference : *Tripterophycis* Boulenger, 1902, Ann.Mag.nat.Hist., 7,9:335

Diagnostic Features : Head small, 5 or more times in standard length, eye diameter equal to or smaller than postorbital length; chin barbel present; upper jaw falling short of rear margin of eye. First dorsal fin short-based, with 5 to 7 rays; second dorsal appearing as two distinct fins separated by a very low, scarcely visible median segment, the anterior section short-based and high, the posterior long-based and low; anal fin long-based, originating on anterior one-fourth of body, not indented; pectoral fins reaching beyond origin of anal fin base; pectoral fins with one or two moderately elongate rays.. Ventral light organ present.

Size: Reaching about 33 cm total length.

Habitat, Distribution and Biology : Rare fishes, apparently benthopelagic at depths from 100 to more than 1 000 m in the subtropical to temperate South Pacific and southern Indian Oceans.

Interest to Fisheries : None.

Literature : Paulin (1983); Sazonov & Shcherbachev (1986).

List of Species :

Tripterophycis gilchristi Boulenger, 1902 - South Africa and Madagascar to New Zealand.

Tripterophycis svetovidovi Sazonov & Shcherbachev (1986) - Sala y Gomez Ridge in eastern Pacific, Madagascar, Australia

Key to Species:

1a. Jaw teeth compressed, incisor-like, close together .... ***T. gilchristi***

1b. Jaw teeth conical, widely spaced .... ***T. svetovidovi***

Tripterophycis gilchristi Boulenger, 1902

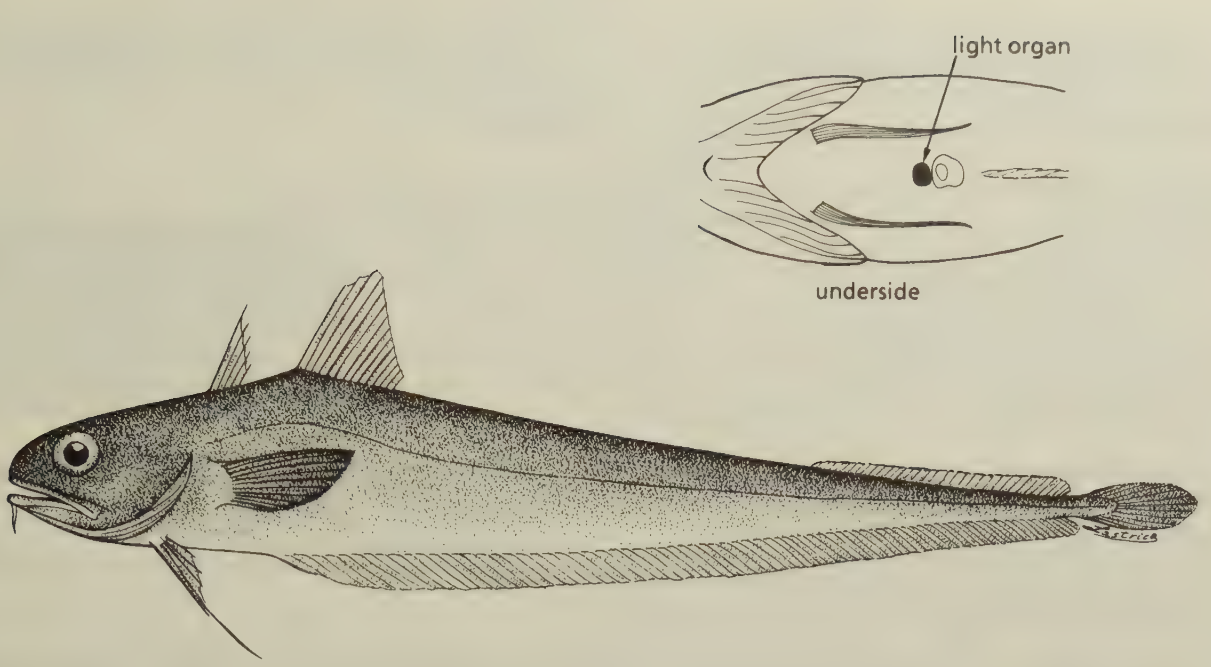
Fig. 814

MOR Tript 1

Scientific Name with Reference : ***Tripterophycis gilchristi*** Boulenger, 1902, Ann.Mag.nat.Hist., 7,9:335.

Synonyms : ***Tripterophycis intermedius*** Whitley, 1948.

FAO Names : **En** - Grenadier cod.


light organ
underside

(after Paulin, 1986)

Fig. 814

Diagnostic Features : Jaw teeth compressed, incisor-like, set in a single row; vomer and palatines lacking teeth. **Colour:** pale brown to pink.

Geographical Distribution : Known from New Zealand, Australia (New South Wales through the Great Australian Bight), Sumatra, southwestern Indian Ocean, and mid-south Atlantic (Fig. 815).

Habitat and Biology : Benthopelagic at depths from 100 to more than 1 000 m.

Size : Reaching about 33 cm total length.

Interest to Fisheries : None.

Local Names : AUSTRALIA, NEW ZEALAND : Grenadier cod.

Literature : Paulin (1983).

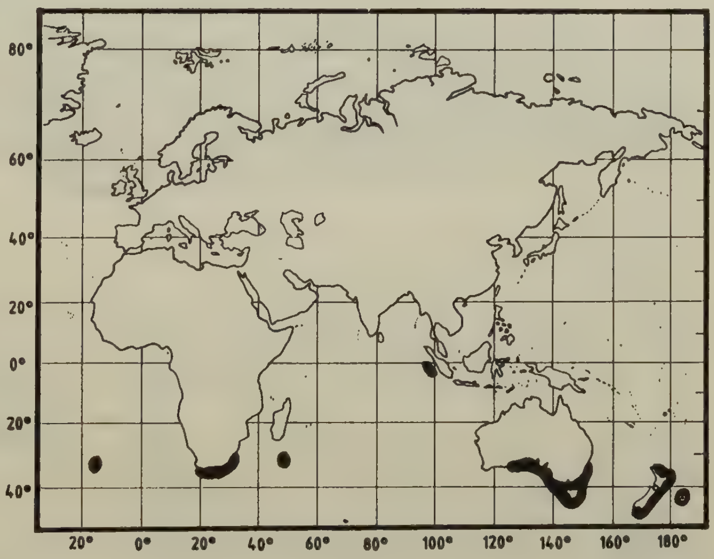

80°
60°
40°
20°
0°
20°
40°
20°
0°
20°
40°
60°
80°
100°
120°
140°
160°
180°

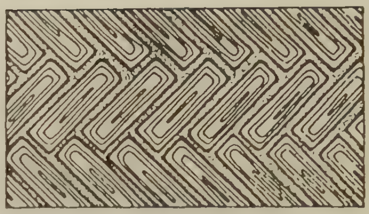
Fig. 815

2.9 FAMILY MURAENOLEPIDIDAE

MURAENOL

FAO Names : En - Moray cods; Fr - Gadomurènes; Sp - Gadimorenas.

General Features : Body long and compressed. Head small, with a mental barbel; gill openings restricted; not extending above the pectoral fin base. No spines in fins; dorsal, caudal and anal fins joined together; 2 dorsal fins, the first with only 1 ray (dorsal filament); a single anal fin; pectoral fin rays 10 to 13; pelvic fins thoracic in position, with 5 rays, of which the 2 or 3 outer rays are prolonged and at least partially free. Lateral line not extending to hind part of body. Scales elongate, non-imbricate, set at right angles to each other, embedded in the skin which appears smooth (Fig. 816). **Colour :** greyishbrown to reddish, often iridescent reflections.


arrangement of scales (schematic) Fig. 816

Habitat, Distribution and Biology : The muraenolepids are restricted to the cold-temperate waters of the southern Hemisphere. They were considered a typically Antarctic family by Andriashev (1965), but De Witt (1971) believes that they are more recent invaders of the Southern Ocean. Muraenolepids live near the sea bottom at moderate depths on the continental shelf and the upper part of the slope, but feed primarily on zooplankton.

Interest to Fisheries : Moray cods are occasionally taken with bottom trawls, but none of the species appear to be of commercial importance at present.

Remarks : The four species described in a single genus, ***Muraenolepis***, are not well known and a revision of the family is needed.

Muraenolepis Günther, 1880

MURAENOL Mur

Genus with Reference : ***Muraenolepis*** Günther, 1880, Zool.Chall.Exped., 6:17

Diagnostic Features : See family.

Key to species:

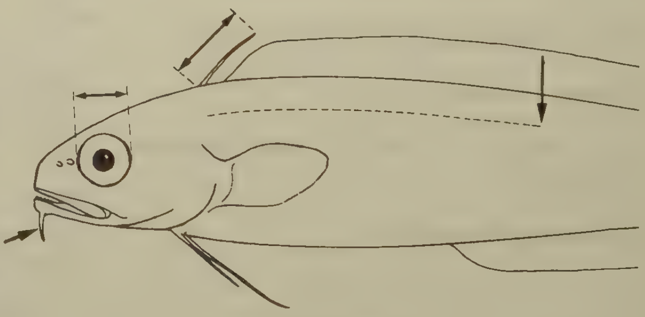
1a. Lateral line reaching backward to below middle of second dorsal fin (Figs 817, 818)

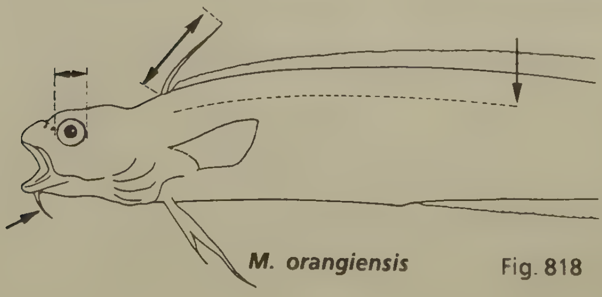
  2a. Filament of first dorsal fin equal to, or a little longer than eye diameter; mental barbel shorter than eye diameter (Fig. 817) ..... ***M. marmoratus***

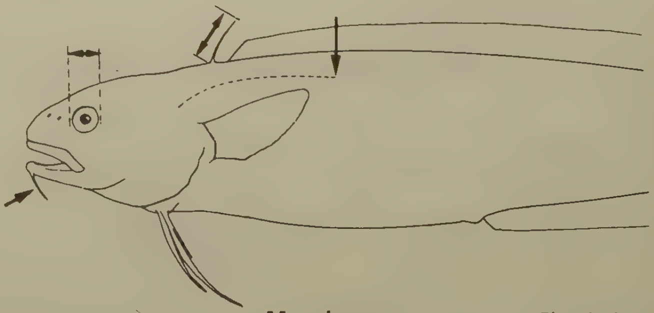
  2b. Dorsal filament 3 times longer than eye diameter; mental barbel equal to eye diameter (Fig. 818) .... ***M. orangiensis***

1b. Lateral line reaching backward slightly beyond tips of pectoral fins (Figs 819, 820)

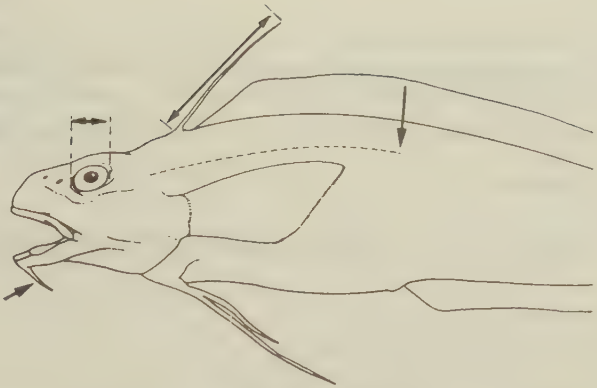
  3a. Dorsal filament no longer than twice the eye diameter; mental barbel longer than eye diameter (Fig. 819) .... ***M. microps***


M. marmoratus Fig. 817


M. orangiensis Fig. 818


M. microps Fig. 819

3b. Dorsal filament 4 times or more than the eye diameter; mental barbel equal to eye diameter (Fig. 820) .... *M. microcephalus*



M. microcephalus Fig. 820

List of Species

Muraenolepis marmoratus Günther, 1880
Muraenolepis microcephalus Norman, 1932
Muraenolepis microps Lönnberg, 1905
Muraenolepis orangiensis Vaillant, 1907

Muraenolepis marmoratus Günther, 1880

Fig. 821

MURAENOL Mur 1

Scientific Name with Reference : ***Muraenolepis marmoratus*** Günther, 1880

Synonyms : None

FAO Names : En - Marbled moray cod; **Fr** - Gadomurène marbrée; **Sp** - Gadimorena jaspeada.

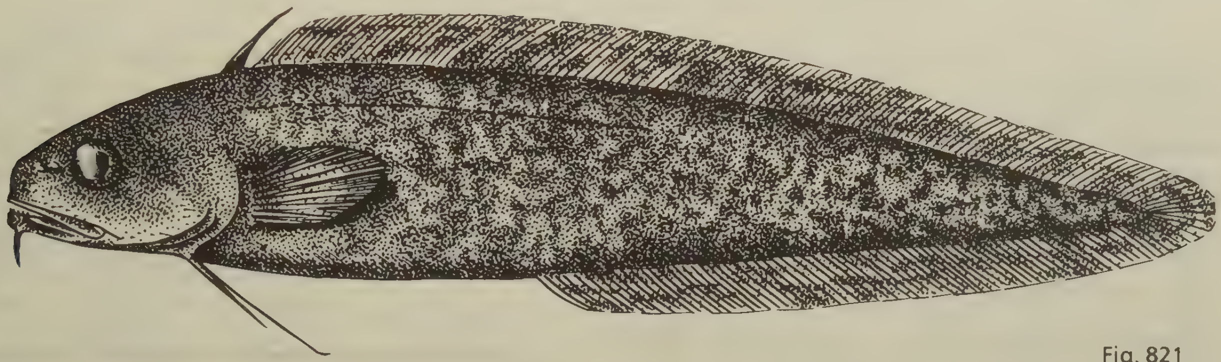


Fig. 821

Geographical Distribution : Only known from the Crozet, Kerguelen and Heard Islands (Fig. 822).

Habitat and Biology : Inhabits waters over the continental shelf and slope, from 30 to 1 600 m depth. Feeds on zooplankton.

Size : Maximum 40 cm; common to 30 cm.

Interest to Fisheries : Commonly taken as bycatch in bottom trawls (Kerguelen fisheries), but no separate statistics are available.

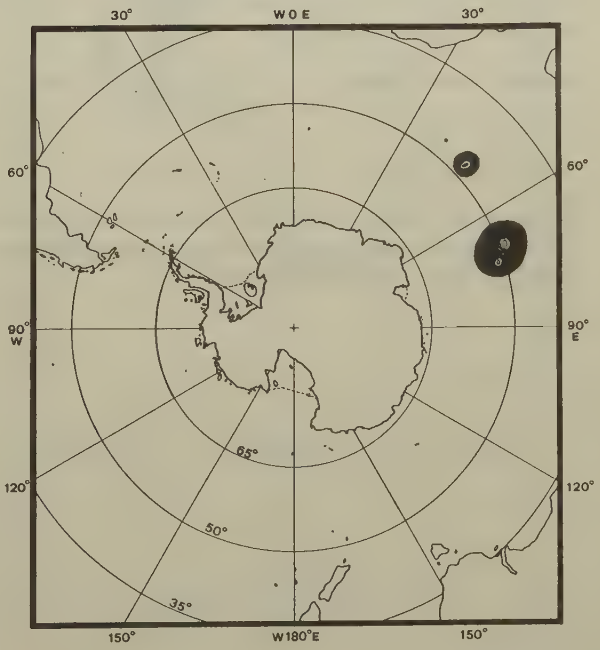


Fig. 822

Muraenolepis microcephalus Norman, 1937

Fig. 823

MURAENOL Mur 2

Scientific Name with Reference : ***Muraenolepis microcephalus*** Norman, 1937

Synonyms : None

FAO Names : En - Smallhead moray cod; **Fr** - Gadomurène microcéphale; **Sp** - Gadimorena microcéfala.

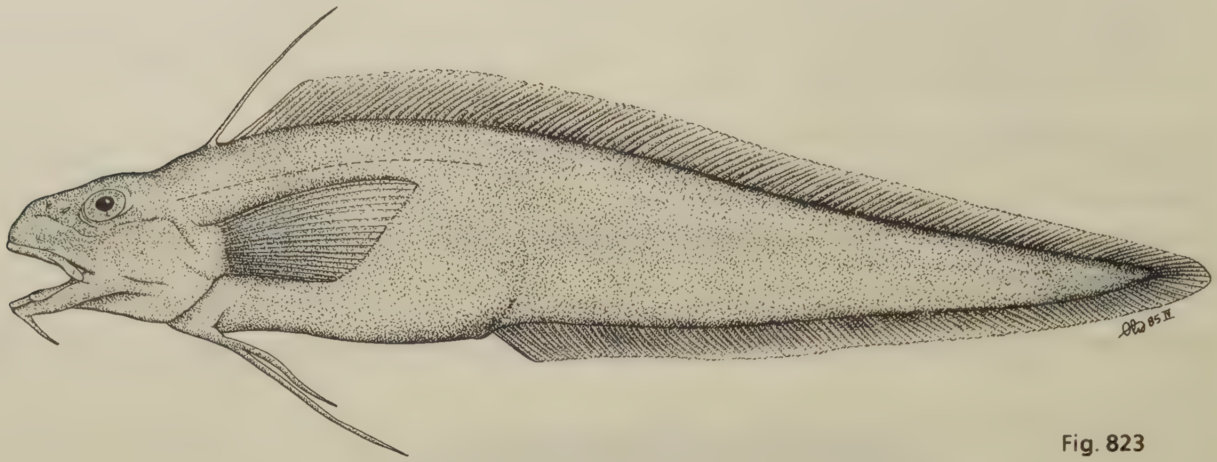


Fig. 823

Diagnostic Features : Body depth about 5.5 times in standard length. Head rather small, its length 5.7 to 6 times in standard length; eye diameter 5.3 to 5.8 times in head length; interorbital width 4 times in head length and larger than eye diameter; mental barbel equal to eye diameter. Dorsal filament (single ray in first dorsal fin) more than 4 times the eye diameter; pectoral fins not extending backward to anus when appressed; outer 2 rays of pelvic fins filamentous, of different lengths. Lateral line reaching backward slightly beyond tips of pectoral fins. **Colour:** brownish-grey, with iridescent hues.

Geographical Distribution : Scotia Ridge (South Georgia, Sandwich Islands), South Orkney and South Shetland Islands, northern part of Antarctic Peninsula and Enderby coast (Fig. 824).

Habitat and Biology : Inhabits waters over the continental shelf and slope. Feeds on zooplankton.

Size : Maximum 30 cm; common to 27 cm.

Interest to Fisheries : Taken occasionally as bycatch in bottom trawls around the Islands of the Scotia Arch. Probably used only for fishmeal.

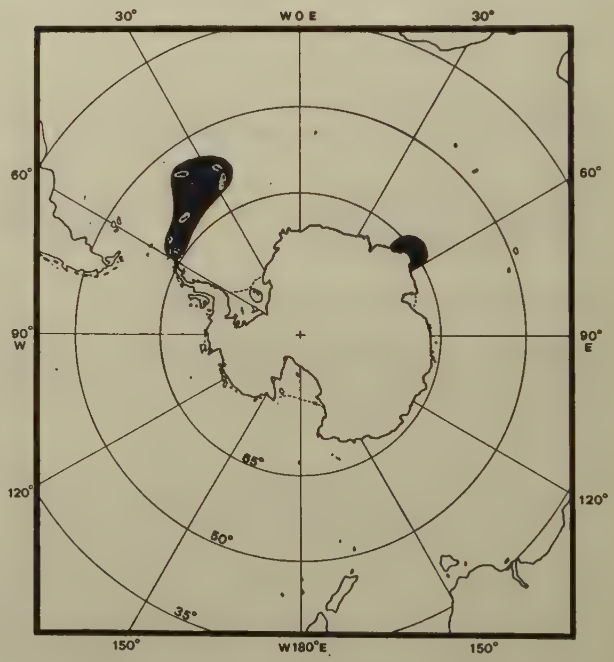


Fig. 824

Muraenolepis microps Lönnberg, 1905

Fig. 825

MURAENOL Mur 3

Scientific Name with Reference : ***Muraenolepis microps*** Lönnberg, 1905

Synonyms : None

FAO Names : **En** - Smalleye moray cod; **Fr** - Gadomurène petit oeil; **Sp** - Gadimorena ojichica.

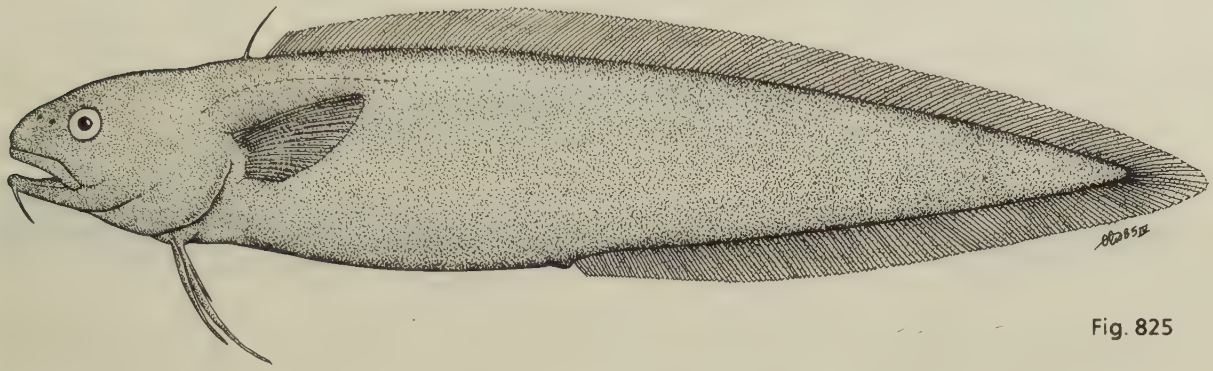


Fig. 825

Diagnostic Features : Body depth 4.8 times in standard length. Head length about 5.6 times in standard length, head profile over eye distinctly curved; eye diameter 5.3 times in head length; interorbital width about 4.5 times in head length; mental barbel longer than eye diameter. Dorsal filament (single ray in front of dorsal fin) variable in length, but never longer than twice the eye diameter. Outer rays of pelvic fin filamentous, of different length Lateral line arched above pectoral fin, reaching backward to slightly beyond pectoral tips. **Colour:** uniform grey-brown, with iridescent hues.

Geographical Distribution : Coasts of Antarctic Peninsula, South Georgia, Sandwich, Orkney and Shetland Islands and Victoria Land (Fig. 826).

Habitat and Biology : Inhabits waters between 10 and 1 600 m depth. Feeds mainly on zooplankton.

Size : Maximum 35 cm; common to 27 cm.

Interest to Fisheries : Taken occasionally as bycatch in bottom trawls around the Islands of Scotia Arch. Probably used only for fishmeal.

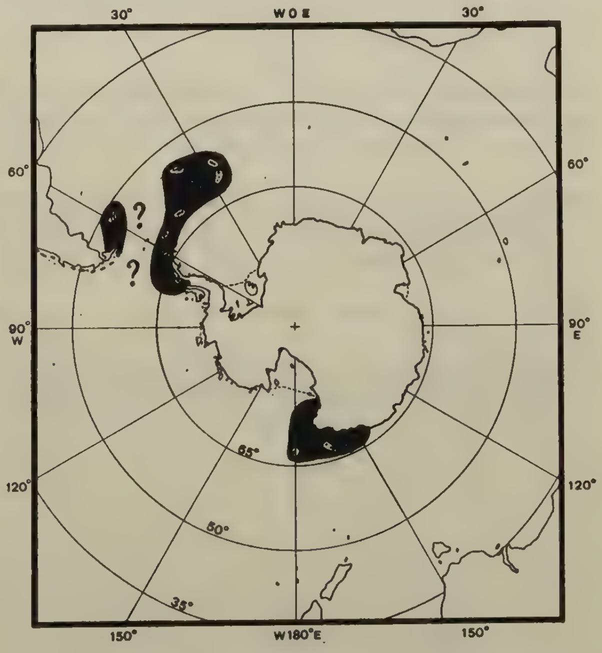


Fig. 826

Muraenolepis orangiensis Vaillant, 1907

Fig. 827

MURAENOL Mur 4

Scientific Name with Reference : ***Muraenolepis orangiensis*** Vaillant, 1907

Synonyms : None

FAO Names : **En** - Patagonian moray cod; **Fr** - Gadomurène de Patagonie; **Sp** - Gadimorena patagonica.

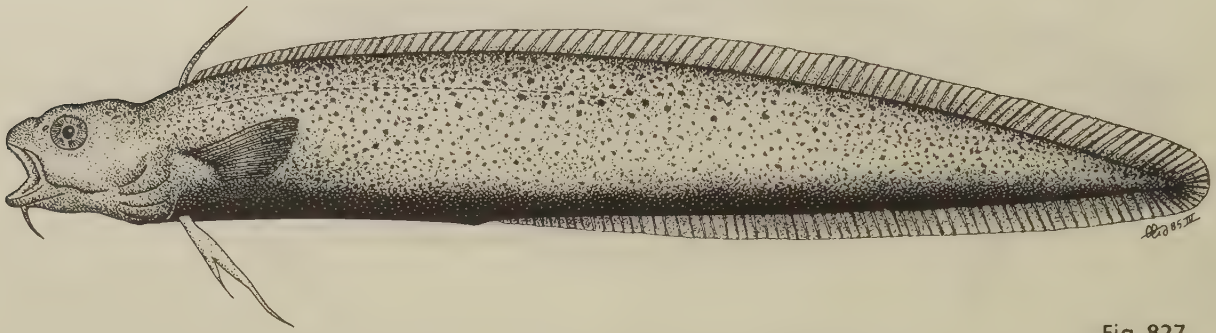


Fig. 827

Diagnostic Features : Body depth 6.5 times in standard length. Head small, its length about 6.3 times in standard length; eye diameter more than 5 times in head length and greater than interorbital width; mental barbel equal to eye diameter. Dorsal filament (single ray in first dorsal fin) 3 times longer than eye diameter; pectoral fins rather short, not extending backward to anus when appressed; outer ray of pelvic fins filamentous. Lateral line reaching backward to below middle of second dorsal fin. **Colour:** grey-reddish; body covered with numerous small black dots; abdomen black.

Geographical Distribution : ***Muraenolepis orangiensis*** has been reported from Patagonian waters and from the Kerguelen, Heard and Crozet Islands (Fig. 828).

Habitat and Biology : Inhabits waters over the continental shelf and slope from 140 to 600 m depth. Feeds on zooplankton.

Size : Maximum 30 cm; common to 20 cm.

Interest to Fisheries : Taken as bycatch in bottom trawls in shelf and slope waters around the Kerguelen Islands.

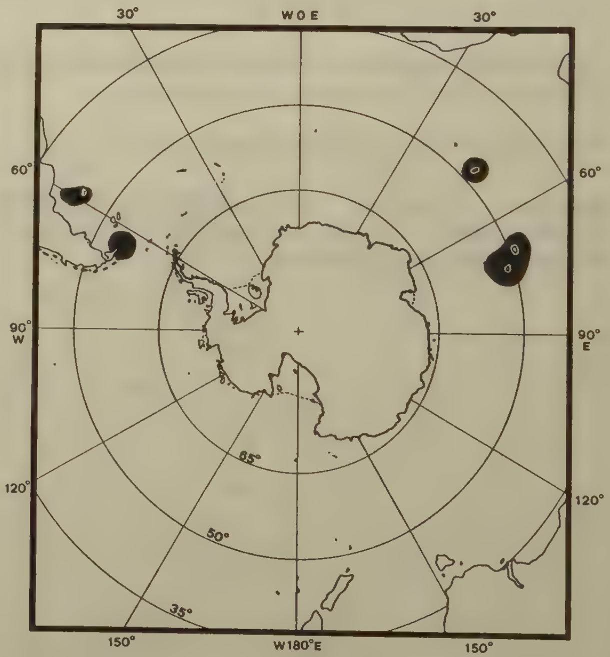


Fig. 828

3. LIST OF SPECIES BY MAJOR FISHING AREAS

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
BREGMACEROTIDAE																					
Bregmaceros sp	17											●									
GADIDAE																					
Arctogadus borisovi	25		●	●	●																
Arctogadus glacialis	26		●	●	●																
Boreogadus saida	27		●	●	●										●	●					
Brosme brosme	29			●	●																
Ciliata mustela	32				●																
Ciliata septentrionalis	33				●																
Eleginus gracilis	34		●												●	●					
Eleginus navaga	36		●		●																
Enchelyopus cimbrius	38			●	●	●	●														
Gadiculus argenteus	39				●		●	●													
Gadus macrocephalus	42														●	●		●			
Gadus morhua	44		●	●	●																

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Gadus ogac	47		●	●	●																
Gaidropsarus biscayensis	49				●		●	●													
Gaidropsarus macrophthalmus	50				●																
Gaidropsarus mediterraneus	50				●			●													
Gaidropsarus vulgaris	51				●			●													
Lota lota	53	02, 04, 05, 07																			
Melanogrammus aeglefinus	54			●	●																
Merlangius merlangus	56				●			●													
Microgadus proximus	58															●		●			
Microgadus tomcod	58			●																	
Micromesistius australis	60								●		●								●	●	
Micromesistius poutassou	61			●	●		●	●													
Molva dypterygia	63			●	●		●	●													
Molva molva	64			●	●			●													
Phycis blennoides	66				●		●	●													

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Phycis chesteri	67			●		●															
Phycis phycis	68				●		●	●													
Pollachius pollachius	70				●																
Pollachius virens	71			●	●	●															
Raniceps raninus	73				●																
Theragra chalcogramma	75														●	●		●			
Theragra finnmarchica	76				●																
Trisopterus esmarkii	77				●																
Trisopterus luscus	79				●		●	●													
Trisopterus minutus	80				●		●	●													
Urophycis brasiliensis	82								●												
Urophycis chuss	83			●		●															
Urophycis cirrata	85					●															
Urophycis earlii	85					●															
Urophycis floridana	86					●															

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Urophycis regia	87			●		●															
Urophycis tenuis	88			●	●	●															
MACROURIDAE																					
Bathygadus macrops	94			●		●	●			●											
Bathygadus melanobranchus	95				●	●	●			●											
Gadomus arcuatus	97					●	●														
Albatrossia pectoralis	110														●	●		●			
Coelorinchus acanthiger	139									●		●									
Coelorinchus aconcagua	140								●											●	
Coelorinchus anatirostris	141														●						
Coelorinchus argentatus	142												●				●				
Coelorinchus argus	144																●				
Coelorinchus aspercephalus	145																		●		
Coelorinchus australis	146												●						●		
Coelorinchus biclinozonalis	147																		●		

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Coelorinchus braueri	149									●		●									
Coelorinchus canus	150																	●		●	
Coelorinchus caribbaeus	151					●			●												
Coelorinchus chilensis	152																			●	
Coelorinchus coelorhincus	154			●	●	●	●	●		●											
Coelorinchus denticulatus	155											●									
Coelorinchus fasciatus	156								●	●			●						●	●	
Coelorinchus formosanus	158														●						
Coelorinchus hexfasciatus	159														●						
Coelorinchus innotabilis	161												●						●		
Coelorinchus japonicus	162														●						
Coelorinchus kaiyomaru	163								●	●			●						●		
Coelorinchus kamoharai	164														●						
Coelorinchus karrerae	166									●		●	●								
Coelorinchus kishinouyei	167														●						

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Coelorinchus labiatus	168				●		●														
Coelorinchus longicephalus	169														●						
Coelorinchus macrochir	171														●						
Coelorinchus marinii	172								●		●										
Coelorinchus matamua	173									●			●						●		
Coelorinchus multispinulosus	174														●						
Coelorinchus occa	176					●															
Coelorinchus oliverianus	177																		●		
Coelorinchus parallelus	178														●		●				
Coelorinchus productus	179														●						
Coelorinchus scaphopsis	181																	●			
Coelorinchus ventrilux	182					●															
Coryphaenoides acrolepis	202														●	●		●			
Coryphaenoides anguliceps	203																	●			
Coryphaenoides ariommus	204																			●	

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Coryphaenoides armatus	205			●	●		●		●	●	●		●	●	●	●		●	●	●	
Coryphaenoides carminifer	206																	●			
Coryphaenoides cinereus	207														●		●				
Coryphaenoides delsolari	209																	●		●	
Coryphaenoides guentheri	210				●		●	●													
Coryphaenoides longifilis	211														●						
Coryphaenoides macrocephalus	212					●	●														
Coryphaenoides marginatus	214														●						
Coryphaenoides mexicanus	215					●															
Coryphaenoides nasutus	216														●						
Coryphaenoides rupestris	217			●	●	●	●														
Coryphaenoides serrulatus	219												●						●		
Coryphaenoides subserrulatus	220								●	●									●		
Coryphaenoides zaniophorus	221			●		●	●														
Cynomacrurus piriei	223								●		●		●	●							●

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Hymenocephalus italicus	230				●	●	●	●	●	●											
Lepidorhynchus denticulatus	232												●						●		
Macrourus berglax	235			●	●																
Macrourus carinatus	236								●	●				●					●	●	
Macrourus holotrachys	237								●		●										
Macrourus whitsoni	238								●		●			●							●
Malacocephalus laevis	242				●	●	●		●	●		●	●				●				
Malacocephalus occidentalis	243			●		●	●		●	●											
Mataeocephalus acipenserinus	246																	●			
Mataeocephalus tenuicauda	247																	●			
Nezumia aequalis	264			●	●	●	●	●	●	●											
Nezumia atlantica	265					●															
Nezumia bairdi	266			●		●															
Nezumia brevibarbata	267									●											
Nezumia condylura	269														●						

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Nezumia convergens	270																	●		●	
Nezumia duodecim	271						●			●											
Nezumia latirostrata	272																	●		●	
Nezumia liolepis	274																	●			
Nezumia loricata	275												●					●		●	
Nezumia micronychodon	276						●			●											
Nezumia milleri	278									●											
Nezumia orbitalis	279																	●		●	
Nezumia propinqua	280											●			●			●		●	
Nezumia proxima	281														●		●				
Nezumia pudens	282																			●	
Nezumia pulchella	283																				
Nezumia sclerorhynchus	284			●	●	●	●	●													
Nezumia stelgidolepis	286															●		●		●	
Sphagemacrurus grenadae	289			●		●															

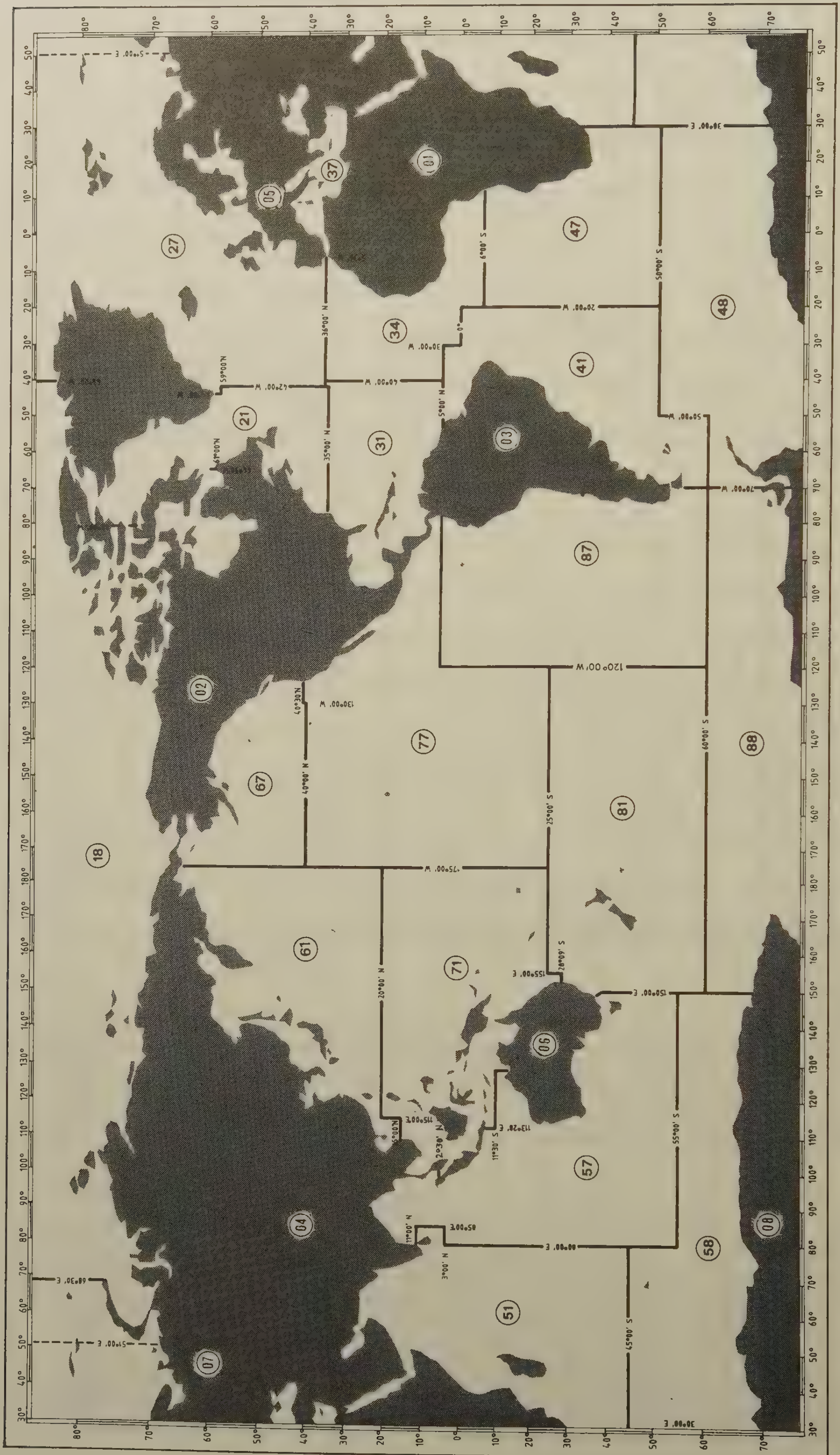
SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Trachonurus sulcatus	290				●	●	●														
Ventrifossa atherodon	296																	●			
Ventrifossa ctenomelas	297																	●			
Ventrifossa divergens	299											●			●		●				
Ventrifossa garmani	300														●						
Ventrifossa macropogon	301					●															
Ventrifossa macroptera	303														●						
Ventrifossa misakia	304														●						
Ventrifossa mucocephalus	305					●															
Ventrifossa nasuta	306											●									
Ventrifossa nigrodorsalis	307														●		●				
Ventrifossa nigromaculata	309												●						●	●	
Ventrifossa petersoni	310											●	●				●				
Trachyrincus helolepis	315																	●		●	
Trachyrincus scabrus	316				●		●	●													
Trachyrincus villegai	317																			●	

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
MERLUCCIDAE																					
Macruronus capensis	324									●											
Macruronus magellanicus	325								●												
Macruronus novaezelandiae	326												●								
Merluccius albidus	330			●		●															
Merluccius angustimanus	331																	●			
Merluccius australis	332								●										●	●	
Merluccius bilinearis	334			●		●															
Merluccius capensis	335									●		●									
Merluccius gayi	336																			●	
Merluccius hubbsi	337								●												
Merluccius merluccius	339			●			●	●													
Merluccius paradoxus	340									●		●									
Merluccius polli	341						●			●											
Merluccius productus	342															●		●			

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Merluccius senegalensis	343						●														
Steindachneria argentea	345					●															
MORIDAE																					
Antimora microlepis	353														●	●		●			
Antimora rostrata	354			●	●	●			●	●	●	●	●	●				●	●	●	
Auchenoceros punctatus	355																		●		
Austrophycis marginata	356								●				●						●	●	
Eeyorius hutchinsi	357												●								
Gadella imberbis	358			●		●	●		●	●											
Gadella maraldi	359				●		●	●													
Halargyreus johnsonii	360			●	●		●		●		●			●	●				●	●	
Laemonema laureysi	362						●														
Laemonema longipes	363														●	●					
Lepidion ensiferus	364								●												
Lepidion eques	365			●	●																

SPECIES	PAGE	FRESH-WATERS	GEOGRAPHICAL DISTRIBUTION																		
			MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES																		
			18	21	27	31	34	37	41	47	48	51	57	58	61	67	71	77	81	87	88
Lepidion lepidion	366							●													
Mora moro	369				●		●	●				●	●						●	●	
Physiculus dalwigkii	370						●	●													
Physiculus japonicus	372														●						
Pseudophycis bachus	373												●						●		
Pseudophycis barbata	374												●						●		
Pseudophycis breviuscula	375												●						●		
Salilota australis	377								●											●	
Tripterophycis gilchristi	378									●		●	●						●		
Muraenolepis marmoratus	381													●							
Muraenolepis microcephalus	382										●			●							
Muraenolepis microps	383								●		●			●							●
Muraenolepis orangiensis	384								●		●			●							

MAJOR MARINE FISHING AREAS FOR STATISTICAL PURPOSES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5. INDEX OF SCIENTIFIC AND VERNACULAR NAMES

A

Abadejo 70
Abadekho 62
Abambolo 243
Abambolo de bajura 242
abbreviatus, Coelorhynchus 158
abditilux, Coelorinchus 137
abei, Lionurus 281
Abrotea 67,83
Abrotea de natura 371
Abrotia 69
Abyssal grenadier 205
Abyssal macrourid 206
Abyssicola macrochir 171
Abyssicola 111
abyssorum, Coryphaenoides 205
abyssorum, Gadus 63
abyssorum, Molva 63
abyssorum, Nematonurus 205
acanthiger, Coelorinchus 139
acantholepis, Coelorinchus 137
acipenserinus, Mataeocephalus 246
aconcagua, Coelorinchus 140
Aconcagua grenadier 140
acrolepis, Coryphaenoides 202
acrolepis, Hemimacrurus 202
acrolepis, Nematonurus 202
Actuariolum sp. 356
acus, Coelorhynchus 142
acutirostris, Coelorinchus 137
adustus, Mataeocephalus 245
aeger, Hymenocephalus (H.) striatissimus 230
Aeglefinus linnei 54
aeglefinus, Melanogrammus 54
aeglefinus, Morhua 54
aequalis, Coryphaenoides (Macrurus) 264
aequalis, Lionurus (Nezumia) 264
aequalis, Macrurus 264
aequalis, Nezumia 264
aequalis, Nezumia (Lionurus) 264
aequatoris, Coryphaenoides (C.) 201
affinis, Coryphaenoides (N.) 201
affinis, Halargyreus 360
africana, Nezumia 263
agilis, Gadus 27
Agoullanós 52
Ahuru 355
Alaska pollock 75,76
alateralis, Coryphaenoides (C.) 201
Albatrossia 110
Albatrossia pectoralis 110
albidus, Gadus 66
albidus, Merluccius 330
albus, Merlangus 61
Aloha grenadier 280
altipinnis, Coryphaenoides (C.) 201
altipinnis, Nematonurus sp. aff. 209
Amami grenadier 214
ambiguous, Merluccius 359
ambiguus, Merlucius 339
American burbot 54
American straptail grenadier 243
americana, Morrhua 44
americanus, Brosmius 29
americanus, Enchelyopus 83
americanus, Phycis 83,88
anagirostris, Coelorhynchus 141
anatirostris, Coelorhynchus 141
anatirostris, Coelorinchus 141
andriashevi, Idiolophorhynchus 313
Ane 55
anguliceps, Coryphaenoides 203
angusticeps, Merluccius 331
angustimanus, Merluccius 331
Anon 55
anonyme, Trachyrincus 316
Antimora 352,354
Antimora australis 354
Antimora meadi 354
Antimora microlepis 353
Antimora rhina 354
Antimora rostrata 354
Antimore bleu 354
Antonogadus macrophthalmus 50
Antonogadus megalokynodon 49
antraeus, Hymenocephalus (H.) 230
antrodes, Bathygadus 94
aoteanus, Gadomus 97
arabicus, Bregmaceros 16
aratrum, Coelorinchus 137
Arbitán 64
Arctic cod 29
Arctogadus 25
Arctogadus borisovi 25
Arctogadus glacialis 26
arcuatus, Gadomus 97
arenosus, Gadus 44
argentatus, Coelorinchus 142
argentatus, Gaidropsarus 49
argentatus, Merluccius 339
argentea, Steindachneria 345
argenteola, Motella (Couchia) 32
argenteolus, Gadus 50
argenteus, Gadiculus 39
argenteus, Merlangus 39
argentinae, Macruronus 325
Argentine hake 337

Argentino 325
argus, Coelorinchus 144
argyropastus, Physiculus 370
ariommus, Coryphaenoides 204
armatus, Coryphaenoides 205
armatus, Coryphaenoides (Nematonurus) 205
armatus, Macrurus (Nematonurus) 205
armatus, Nematonurus 205
Armourhead grenadier 315
Armout 80
Arrow toothed grenadier 297
Arrowtooth grenadier 296
Artic cod 26
Asellus canariensis 369
Asinello 55,80
asper, Coryphaenoides (C.) 201
asper, Macrourus 304
asper, Macrurus 205
aspercephalus, Coelorinchus 145
asperrimus, Coryphaenoides 290
asperrimus, Trachonurus 290
asprellus, Coryphaenoides (C.) 201
asteroides, Coelorinchus 137
Atacama grenadier 282
Ateleobrachium 183
aterrimus, Hymenocephalus (P.) 230
atherodon, Lionurus (Nezumia) 296
atherodon, Ventrifossa 296
atherodon, Ventrifossa (Atherodus) 296
Atlantic cod 45
Atlantic tomcod 58,59
atlantica, Nezumia 265
atlanticus, Bregmaceros 16
atlanticus, Coelorhynchus 154
atripinnis, Bregmaceros 16
attenuatus, Merluccius 359
Auchenoceros 355
Auchenoceros punctatus 355
auratus, Gadus 42
australis, Antimora 354
australis australis, Micromesistius 60
australis, Coelorhynchus 146,147
australis, Macrurus 146,147
australis, Macrurus (Coelorhynchus) 147
australis, Merlangius (Huttonichthys) 332
australis, Merluccius 332
australis, Merluccius gayi 332
australis, Micromesistius 60
australis, Micromesistius australis 60
australis pallidus, Micromesistius 60
australis, Salilota 377
Austrophycis 356
Austrophycis marginata 356
Austrophycis megalops 356
awae, Coryphaenoides 214

B

Bacaladilla 61,62
Bacalao 72
Bacalao austral 377
Bacalao boreal 34
Bacalao criollo 377
Bacalao de Groenlandia 47
Bacalao del Artico 26,36
Bacalao del Atlántico 45
Bacalao del Pacifico 42
Bacalao polar 27
Bacalhau 55,62,71
Bacaliar 57
Bacaliaraki 40
Bacaliarakí 80
bacchus, Pseudophycis 373
bachus, Lotella 373
bachus, Physiculus 373
bachus, Physiculus (Pseudophycis) 373
bachus, Pseudophycis 373
Badejo 57,72
bairdi, Nezumia 266
bairdii, Coryphaenoides 266
bairdii, Lionurus (Nezumia) 266
Bakalá 80
Bakaliáros 340
Bakallaraki 79
Bakalyaro 57
Bakayaro 62
Ballotra 52
Banded rattail 158
Banded whiptail 156,158
Bandstert 324
barattinii, Coryphaenoides 172
Barbada 49
barbata, Morhua 79
barbata, Pseudophycis 374
barbatulum, Laemonema 361
barbatulus, Hymenocephalus (P.) 230
barbatus, Gadus 79
barbatus, Gaidropsarus 49
barbatus, Physiculus 374
barbiger, Lionurus (Lionurus) 274
barbiger, Macrurus 274
barbiger, Ventrifossa 274
Barraud 79
Bartola 67
Bastard cod 375
Bastard red cod 375
Bathygadus 93
Bathygadus antrodes 94
Bathygadus bowersi 94
Bathygadus cottoides 94
Bathygadus entomelas 94
Bathygadus favosus 94
Bathygadus filamentosus 94
Bathygadus furvescens 94
Bathygadus garretti 94
Bathygadus goethemi 94
Bathygadus macrops 94
Bathygadus melanobranchus 95
Bathygadus micronemus 94
Bathygadus nipponicus 94
Bathygadus spongiceps 94
Bathygadus sulcatus 94
Bathygadus vaillanti 95
bathymaster, Bregmaceros 16
Batrachocephalus blennioides 73
Batrachoides blennioides 73
Batrachoides gmelini 66
Bearded rock cod 375
Beardie 367,375

Beardless codling 358
Benguela hake 341
berglax, Coryphaenoides (Macrourus) 235
berglax, Macrourus 235
Berlam 340
Berlevagfish 76
Bertorella 50,51
Bialy widlak 67
Bib 79
bibus, Gadus 79
biclinozonalis, Coelorinchus 147
bifurcus, Gadus 66
Bigeye grenadier 237
Bigeye rockling 50
Bighead grenadier 212
bilinearis, Merluccius 330,334,337
billsamorum, Hymenocephalus (H.) 230
Birkelanga blalange 64
biscayensis, Gaidropsarus 49
Black codling 371
Black grenadier 219
Black spotted whiptail 310
Blackfin grenadier 151
Blackspotted grenadier 309
Blalanga 64
Blalange 64
Blauer Wittling 62
Blauleng 64
Blauwe leng 64
Blawe wijting 62
Bleka 71
Blekitek 62
blennioides, Batrachocephalus 73
blennioides, Batrachoides 73
Blennius fuscus 73
Blennius gadoides 66
Blennius raninus 73
Blennius torsk 29
Blennius trifurcatus 73
blennoides, Phycis 66
Blue antimora 354
Blue banded whiptail 174
Blue grenadier 326,327
Blue hake 327,354
Blue ling 63
Blue Ling 64
Blue whiting 61,62
Bogoslovius 183
Bogoslovius clarki 211
Bogoslovius firmisquamis 202
Bolsheglazaya Mol'va 64
Bolsheglazaya tresochka 40
Bolsheglaziy niteperiy nalim 67
bona-nox, Coryphaenoides 202
boops, Coryphaenoides (C.) 201
borealis, Molvella 32
borealis, Phycis 88
Boreogadus 27
Boreogadus pearyi 25
Boreogadus polaris 27
Boreogadus poutassou 61
Boreogadus saida 27
boretzi, Malacocephalus (P.) 241
borisovi, Arctogadus 25
Bourricot 55
bovei, Salilota 377
bowersi, Bathygadus 94
brachycolus, Lyconus 322
Brachygadus minutus 80
brandti, Gadus 42
brasiliensis, Urophycis 82
braueri, Coelorinchus 149
Brazilian codling 82
Bredtorsk 79
Bregmacère de l'océan Indien 17
Bregmacères 16
Bregmaceros 16
Bregmaceros 16
Bregmaceros sp. 17
Bregmaceros arabicus 16
Bregmaceros atlanticus 16
Bregmaceros atripinnis 16
Bregmaceros bathymaster 16
Bregmaceros cantori 16
Bregmaceros cayorum 16
Bregmaceros houdei 16
Bregmaceros japonicus 16
Bregmaceros lanceolatus 16
Bregmaceros longipes 16
Bregmaceros mcclellandi 16,17
Bregmaceros nectabanus 16
Bregmaceros neonectabanus 16
Bregmaceros pescadorus 16
Bregmaceros punctatus 355
Bregmaceros rarisquamosus 16
BREGMACEROTIDAE 16
brevibarbata, Nezumia 267
brevibarbatus, Macruroplus 267
brevibarbatus, Nezumia 267
brevibarbis, Coryphaenoides (C.) 201
brevipes, Halargyreus 360
brevirostris, Coelorinchus 137
brevirostris, Nezumia 263
breviuscula, Pseudophycis 375
Bristly grenadier 290
Broadsnout grenadier 272
Brochet de mer 340
Brosme 29
Brosme 31
brosme, Brosme 29
Brosme brosme 29
brosme, Brosmius 29
brosme, Enchelyopus 29
brosmina, Lota 53
Brosmio 29
Brosmius americanus 29
Brosmius brosme 29
Brosmius flavescens 29
Brosmius flavesny 29
Brosmius scotica 29
Brosmius vulgaris 29
Brotola 356
Brótola 83
Brótola brasileña 82
Brotola brava 377
Brótola de fango 66,67
Brótola de roca 68,69
bubonis, Nezumia 263
bucephalus, Coryphaenoides (C.) 201
bulbiceps, Coryphaenoides (C.) 201

Bullseye grenadier 94
Burbot 53,54
burragei, Nezumia 263
Busbano 80
Byrkelange 64
byrkelange, Gadus 63
byrkelange, Molva 63

C

cadenati, Merluccius 341
cadenati, Merluccius merluccius 341
Calever 55
California grenadier 286
californica, Morrhua 58
californicus, Gadus 58
callarias kildinensis, Gadus 44
callarias macrocephalus, Gadus 42
callarius, Gadus 44
callarius maris-albi, Gadus 47
Campbell whiptail 163
camurus, Coryphaenoides (C.) 201
canariensis, Asellus 369
cantori, Bregmaceros 16
canus, Coelorhynchus (Coelorhynchus) 150
canus, Coelorinchus 150
canus, Macrurus (Coelorhynchus) 150
Capailla 80
Cape grenadier 324
Cape hake 335
Capela 79
Capelan 67,80
Capelan de Méditerranée 80
capelanus, Gadus 80
capelanus, Gadus (Trisopterus) 80
capelanus, Morva 80
capelanus, Trisopterus minutus 80
Capelin 80
Capella 80
Capellán 80
capensis, Gadomus 97
capensis, Gaidropsarus 49
capensis, Lepidion 364
capensis, Macruronus 324
capensis, Merluccius 335
capensis, Merluccius merluccius 335
capensis, Physiculus 370
capito, Coryphaenoides (C.) 201
Cappellano 80
carapinus, Coryphaenoides (L.) 201
carbonarius, Gadus 71
carbonarius, Merlangus 71
carbonarius, Pollachius 71
Carbonero 71,72
caribbaeus, Coelorhynchus 151
caribbaeus, Coelorhynchus (Coelorhynchus) 151
caribbaeus, Coelorinchus 151
Cariburus 183
Cariburus zaniophorus 221
carinatus, Macrourus 236
carinatus, Macrurus 236
carinifer, Coelorinchus 137
Carioca 340
carminatus, Coryphaenoides 206
Carmine grenadier 206
carminifer, Coryphaenoides 206
Carolina hake 85,86
carpenteri, Onus 50
caudacuta, Motella 38
caudacuta, Rhinonemus 38
cayorum, Bregmaceros 16
chalcogramma chalcogramma, Theragra 75
chalcogramma, Theragra 75
chalcogramma, Theragra chalcogramma 75
chalcogrammus fucensis, Pollachius 75
chalcogrammus, Pollachius 75
Chalinura guentheri 210
Chalinura occidentalis 243
Chalinura pectoralis 110
Chernomorskiy merlang 57
chesteri, Phycis 67
Chigodara 372
chigodarana, Physiculus 370
Chilean grenadier 152
Chilean hake 336
chilensis, Coelorhynchus (Oxymacrurus) 152
chilensis, Coelorinchus 152
chuss, Phycis 83
chuss, Urophycis 83
Ciliata 31
Ciliata glauca 32
Ciliata mustela 32
Ciliata septentrionalis 33
cimbrica, Motella 38
cimbrius, Enchelyopus 38
cimbrius, Gaidropsarus 38
cimbrius, Rhinonemus 38
cinereus, Coryphaenoides 207
cinereus, Macrourus 207
cingulatus, Coelorinchus 137
cirrata, Urophycis 85
clarki, Bogoslovius 211
Clearsnout grenadier 150
Coalfish 72
Coarse nosed grenadier 316
Coccolus 111
Cod 47,375
Codlets 16
Coelocephalus 244
coelorhincus, Coelorinchus 154
Coelorhynchus abbreviatus 158
Coelorhynchus (Abyssicola) macrochir 171
Coelorhynchus acus 142
Coelorhynchus anagirostris 141
Coelorhynchus anatirostris 141
Coelorhynchus atlanticus 154
Coelorhynchus australis 146,147
Coelorhynchus caribbaeus 151
coelorhynchus, Coelorhynchus 154
Coelorhynchus coelorhynchus 154
Coelorhynchus (Coelorhynchus) canus 150
Coelorhynchus (Coelorhynchus) caribbaeus 151
Coelorhynchus (Coelorhynchus) marinii 172
Coelorhynchus coelorhynchus marinii 172
Coelorhynchus (Coelorhynchus) patagoniae 156
Coelorhynchus fasciatus 156
Coelorhynchus intermedius 158
Coelorhynchus japonicus 162,174
Coelorhynchus labiatus 168

coelorhynchus, Macrurus 154
coelorhynchus, Macrurus (Coelorhynchus) 154
coelorhynchus marinii, Coelorhynchus 172
Coelorhynchus mortoni 146
Coelorhynchus occa 176
Coelorhynchus (Oxygadus) occa 176
Coelorhynchus (Oxymacrurus) chilensis 152
Coelorhynchus parallelus 149, 164
Coelorhynchus (Paramacrurus) denticulatus 155
Coelorhynchus (Paramacrurus) fasciatus 156
Coelorhynchus (Paramacrurus) natalensis 155
Coelorhynchus patagoniae 140
Coelorhynchus patagoniae 156
Coelorhynchus scaphopsis 181
Coelorhynchus talismani 168
Coelorhynchus vaillanti 168
Coelorhynchus vermicularis 174
Coelorinchus 111
Coelorinchus sp. B 147
Coelorinchus abditilux 137
Coelorinchus acanthiger 139
Coelorinchus acantholepis 137
Coelorinchus aconcagua 140
Coelorinchus acutirostris 137
Coelorinchus anatirostris 141
Coelorinchus aratrum 137
Coelorinchus argentatus 142
Coelorinchus argus 144
Coelorinchus aspercephalus 145
Coelorinchus asteroides 137
Coelorinchus australis 146,147
Coelorinchus biclinozonalis 147
Coelorinchus bollonsi 137
Coelorinchus braueri 149
Coelorinchus brevirostris 137
Coelorinchus canus 150
Coelorinchus caribbaeus 151
Coelorinchus carinifer 137
Coelorinchus chilensis 152
Coelorinchus cingulatus 137
Coelorinchus coelorhincus 154
Coelorinchus commutabilis 137
Coelorinchus cookianus 137
Coelorinchus denticulatus 155
Coelorinchus divergens 137
Coelorinchus dorsalis 137
Coelorinchus doryssus 137
Coelorinchus flabellispinis 138
Coelorinchus formosanus 158
Coelorinchus gilberti 138
Coelorinchus gladius 138
Coelorinchus hexfasciatus 159
Coelorinchus hige 138
Coelorinchus hubbsi 138
Coelorinchus innotabilis 161,163
Coelorinchus japonicus 162
Coelorinchus jordani 138
Coelorinchus kaiyomaru 163
Coelorinchus kamoharai 164
Coelorinchus karrerae 166
Coelorinchus kermadecus 138
Coelorinchus kishinouyei 167
Coelorinchus labiatus 168
Coelorinchus longicephalus 169
Coelorinchus longissimus 138

Coelorinchus macrochir 171
Coelorinchus macrolepis 138
Coelorinchus macrorhynchus 138
Coelorinchus maculatus 138
Coelorinchus marinii 172
Coelorinchus matamua 173
Coelorinchus matsubarai 138
Coelorinchus mirus 138
Coelorinchus multispinulosus 174
Coelorinchus notatus 138
Coelorinchus occa 176
Coelorinchus oliverianus 147,177
Coelorinchus parallelus 178
Coelorinchus platorhynchus 138
Coelorinchus productus 179
Coelorinchus pseudoparallelus 139
Coelorinchus quadricristatus 138
Coelorinchus quincunciatus 138
Coelorinchus radcliffei 138
Coelorinchus scaphopsis 181
Coelorinchus sexradiatus 138
Coelorinchus smithi 138
Coelorinchus sparsilepis 138
Coelorinchus spinifer 138
Coelorinchus thompsoni 138
Coelorinchus tokiensis 138
Coelorinchus triocellatus 138
Coelorinchus velifer 138
Coelorinchus ventrilux 182
Coelorinchus weberi 138
coheni, Physiculus 370
Cola de rata azul 326
Colas de ratón 90
Coley 72
colias, Gadus 79
Colin 71,72
Colin de Alaska 75
Colin de Noruega 76
Colin noir 72
colinus, Gadus 71
colletti, Gadomus 97
colon, Coryphaenoides 221
Common Atlantic grenadier 264
Common grenadier 267,298
Common mora 369
communis, Merlangus 50,61
communis, Motella 50
commutabilis, Coelorinchus 137
compressa, Lota 53
compressicauda, Laemonema 361
compressus, Gadus 53
condylura, Lionurus (Nezumia) 269
condylura, Nezumia 269
Conesnout grenadier 306
convergens, Lionurus (Nezumia) 270
convergens, Nezumia 270
cookianus, Coelorinchus 137
Coryphaena rupestris 217,235
Coryphaenoides 183
Coryphaenoides abyssorum 205
Coryphaenoides acrolepis 202
Coryphaenoides anguliceps 203
Coryphaenoides ariommus 204
Coryphaenoides armatus 205
Coryphaenoides asperrimus 290

Coryphaenoides awae 214
Coryphaenoides bairdii 266
Coryphaenoides barattinii 172
Coryphaenoides bona-nox 202
Coryphaenoides (C.) aequatoris 201
Coryphaenoides (C.) alateralis 201
Coryphaenoides (C.) altipinnis 201
Coryphaenoides (C.) asper 201
Coryphaenoides (C.) asprellus 201
Coryphaenoides (C.) boops 201
Coryphaenoides (C.) brevibarbis 201
Coryphaenoides (C.) bucephalus 201
Coryphaenoides (C.) bulbiceps 201
Coryphaenoides (C.) camurus 201
Coryphaenoides (C.) capito 201
Coryphaenoides (C.) dubius 201
Coryphaenoides (C.) fernandezianus 201
Coryphaenoides (C.) filamentosus 201
Coryphaenoides (C.) filifer 201
Coryphaenoides (C.) hextii 201
Coryphaenoides (C.) hoskynii 201
Coryphaenoides (C.) leptolepis 201
Coryphaenoides (C.) liocephalus 201
Coryphaenoides (C.) longicirrhus 201
Coryphaenoides (C.) macrolophus 201
Coryphaenoides (C.) marshalli 201
Coryphaenoides (C.) mediterraneus 201
Coryphaenoides (C.) microps 201
Coryphaenoides (C.) murrayi 201
Coryphaenoides (C.) myersi 201
Coryphaenoides (C.) oreinos 201
Coryphaenoides (C.) orthogrammus 201
Coryphaenoides (C.) paradoxus 201
Coryphaenoides (C.) paramarshalli 201
Coryphaenoides (C.) profundicolus 201
Coryphaenoides (C.) rudis 201
Coryphaenoides (C.) semiscaber 201
Coryphaenoides (C.) sibogae 201
Coryphaenoides (C.) striaturus 201
Coryphaenoides (C.) thelestomus 201
Coryphaenoides (C.) tydemani 201
Coryphaenoides (C.) woodmasoni 201
Coryphaenoides carminatus 206
Coryphaenoides carminifer 206
Coryphaenoides cinereus 207
Coryphaenoides (Coelorhynchus) talismani 168
Coryphaenoides colon 221
Coryphaenoides (Coryphaenoides) macrocephalus 212
Coryphaenoides (Coryphaenoides) quadripennatus 220
Coryphaenoides (Coryphaenoides) serrulatus 219
Coryphaenoides (Coryphaenoides) zaniophorus 221
Coryphaenoides cyclolepis 205
Coryphaenoides delsolari 209
Coryphaenoides denticulatus 232
Coryphaenoides gigas 205
Coryphaenoides guentheri 210
Coryphaenoides holotrachys 236
Coryphaenoides ingolfi 210
Coryphaenoides (L.) carapinus 201
Coryphaenoides (L.) filicaudus 201
Coryphaenoides latinasutus 203
Coryphaenoides liraticeps 203
Coryphaenoides longifilis 211
Coryphaenoides macrocephalus 212
Coryphaenoides (Macrourus) berglax 235
Coryphaenoides (Macrurus) aequalis 264
Coryphaenoides (Macrurus) guentheri 210
Coryphaenoides marginatus 214
Coryphaenoides mexicanus 215
Coryphaenoides (N.) affinis 201
Coryphaenoides (N.) ferrieri 201
Coryphaenoides (N.) lecointei 201
Coryphaenoides (N.) yaquinae 201
Coryphaenoides nasutus 216
Coryphaenoides (Nematonurus) armatus 205
Coryphaenoides (Nematonurus) longifilis 211
Coryphaenoides (Nematonurus) pectoralis 110
Coryphaenoides norvegicus 217
Coryphaenoides nov. sp. 209
Coryphaenoides pectoralis 110
Coryphaenoides rupestris 217
Coryphaenoides serratus 264
Coryphaenoides serratus 284
Coryphaenoides serrulatus 219
Coryphaenoides subserrulatus 220
Coryphaenoides variabilis 205
Coryphaenoides whitsoni 238
Coryphaenoides zaniophorus 221
cottoides, Bathygadus 94
Couchia edwardii 38
Couchia glauca 32
Couchia minor 32
Crnkinja 370
ctenomelas, Lionurus (Nezumia) 297
ctenomelas, Ventrifossa 297
ctenomelas, Ventrifossa (Ventrifossa) 297
curtipes, Laemonema 361
Cusk 31
cuspidata, Nezumia 270
cuspidatus, Lionurus (Nezumia) 270
cuspidatus, Macrurus 270
cyclolepis, Coryphaenoides 205
cyclolepis, Dolloa 205
cyclolepis, Macrurus 205
cyclolepis, Moseleya 205
cynodon, Physiculus 370
Cynomacrurus 223
Cynomacrurus piriei 223
cyrano, Nezumia 263
Czarniak 72

D

dalwigkii, Physiculus 371
dannevigi, Mora 369
dara, Nezumia 263
decimalis, Sphagemacrurus 288
Deepsea cod 370
Deepwater Cape hake 340
Deepwater hake 341
Deepwater stockvis 341
dekayi, Phycis 88
delsolari, Coryphaenoides 209
denticulatus, Coelorhynchus (Paramacrurus) 155
denticulatus, Coelorinchus 155
denticulatus, Coryphaenoides 232
denticulatus, Gadomus 97
denticulatus, Lepidorhynchus 232
denticulatus, Macrurus (Optonurus) 232

denticulatus, Optonurus 232
dipterygia, Molva dipterygia 63
dispar, Gadomus 97
divergens, Coelorinchus 137
divergens, Ventrifossa 299
Dogtooth grenadier 223
Dolgokhvost marini 173
Dolgokhvost polosatyi 158
Dolgokhvost vooruzhennyi 206
Dolloa 110,183
Dolloa cyclolepis 205
Dolloa longifilis 211
Dolloa pectoralis 110
Donzela 65
dorsalis, Coelorinchus 137
Dorsch 47
doryssus, Coelorinchus 137
Doublethread grenadier 97
dubius, Coryphaenoides (C.) 201
Duckbill grenadier 141
Dunim ha mikhmoret 67
Dunim ha sel aim 69
duodecim, Nezumia 271
Dwarf cod 356
Dwarf codling 356
Dwarf hake 332

E

earllii, Urophycis 85
East Siberian cod 25
ectenes, Nezumia 263
edelmanni, Gadella 358
edwardii, Couchia 38
Eelpout 54
Eeyorius 357
Eeyorius hutchinsi 357
Eglefin 54,55
Eglefino 54,55
Eleginus 33
Eleginus gracilis 34
Eleginus navaga 36
Eleginus navaga gracilis 34
Eleginus navaga karaensis 36
Eleginus navaga navaga 36
Elingue 65
Enchelyopus 38
Enchelyopus americanus 83
Enchelyopus brosme 29
Enchelyopus cimbrius 38
Enchelyopus lota 53
Enchelyopus mediterraneus 50
Enchelyopus mustela 32
Enchelyopus regalis 87
ensiferus, Lepidion 364
ensis, Gaidropsarus 49
entomelas, Bathygadus 94
Epicopus gayi 336
eques, Lepidion 365
Escolá 64
esculentus, Merlucius 339
esmarkii, Trisopterus 77
Eucla cods 18
EUCLICHTHYIDAE 18
European hake 339
euxinus, Gadus 56
euxinus, Gadus merlangus 56
euxinus, Merlangius merlangus 56
euxinus, Odontogadus merlangus 56
evides, Nezumia 263
Eyespot grenadier 144

F

fabricii, Gadus 27
fabricii, Macrurus 235
Faneca 79
Faneca noruega 77
Faneca plateada 39
fasciata, Ventrifossa 296
fasciatus, Coelorhynchus 156
fasciatus, Coelorhynchus (Paramacrurus) 156
fasciatus, Coelorinchus 156
fasciatus, Garichthys 156
fasciatus, Macrurus (Coelorhynchus) 156
favosus, Bathygadus 94
Femtradet Hawkvabbe 32
Ferkh el bajij 62
fernandeziana, Lotella 368
fernandezianus, Coryphaenoides (C.) 201
ferrieri, Coryphaenoides (N.) 201
Figarotto 80
Fíghi 80
filamentosus, Bathygadus 94
filamentosus, Coryphaenoides (C.) 201
filamentosus, Phycis 83
Filesnout grenadier 155
filicaudus, Coryphaenoides (L.) 201
filifer, Coryphaenoides (C.) 201
filifer, Gadella 358
filodorsale, Laemonema 361
Finescale antimora 353
Finescale codling 353
finnmarchica, Theragra 76
Firebelly grenadier 182
firmisquamis, Bogoslovius 202
firmisquamis, Macrurus 202
Firtraadet Tang Brosme 32
Fivebeard rockling 32
Fjallbrosme 67
Fjord dorsch 48
flabellispinis, Coelorinchus 138
flavescens, Brosmius 29
flavesny, Brosmius 29
floridana, Urophycis 86
Fork beard 69
Forkbeard 68
Formosa grenadier 158
formosanus, Coelorinchus 158
Fourbeard rockling 38
Franzosendorsch 79
Freshwater eel 54
Froschdorsch 74
frost, Gadus 58
Frostfish 59
fucensis, Pollachius chalcogrammus 75
fucensis, Theragra 75
Fuda sokodara 155

fuliginosus, Gadus 73
fulvus, Physiculus 370
Fünfbärtelige Seequappe 32
furcatus, Phycis 66,68,88
furvescens, Bathygadus 94
fusca, Motella 50
fusca, Mustela 50
fusca, Onos 50
fusca, Ventrifossa 296
fuscus, Blennius 73
fuscus, Gadus 50
fuscus, Gadus tomcod 58
fuscus, Raniceps 73

G

Gabeldorsch 67
Gade 79
Gadela 370
Gadella 358
Gadella 359
Gadella edelmanni 358
Gadella filifer 358
Gadella imberbis 358
Gadella jordani 358
Gadella maraldi 359
Gadella molokaiensis 358
Gadella norops 358
Gadella obscurus 358
Gadicule argenté 40
Gadiculus 39
Gadiculus argenteus 39
GADIDAE 18
Gadíkoulos 40
Gadimorena jaspeada 381
Gadimorena microcéfala 382
Gadimorena ojichica 383
Gadimorena patagonica 384
Gadimorenas 380
gadoides, Blennius 66
Gadomurène de Patagonie 384
Gadomurène marbrée 381
Gadomurène microcéphale 382
Gadomurène petit oeil 383
Gadomurènes 380
Gadomus 96
Gadomus aoteanus 97
Gadomus arcuatus 97
Gadomus capensis 97
Gadomus colletti 97
Gadomus denticulatus 97
Gadomus dispar 97
Gadomus introniger 97
Gadomus longifilis 97
Gadomus magnifilis 97
Gadomus melanopterus 97
Gadomus multifilis 97
Gadulus luscus 79
Gadulus minutus 80
Gadus 41
Gadus abyssorum 63
Gadus agilis 27
Gadus albidus 66
Gadus arenosus 44
Gadus argenteolus 50
Gadus auratus 42
Gadus barbatus 79
Gadus bibus 79
Gadus bifurcus 66
Gadus brandti 42
Gadus byrkelange 63
Gadus californicus 58
Gadus callarias kildinensis 44
Gadus callarias macrocephalus 42
Gadus callarius 44
Gadus callarius maris-albi 47
Gadus capelanus 80
Gadus carbonarius 71
Gadus colias 79
Gadus colinus 71
Gadus compressus 53
Gadus euxinus 56
Gadus fabricii 27
Gadus frost 58
Gadus fuliginosus 73
Gadus fuscus 50
Gadus heteroglossus 44
Gadus jubatus 50
Gadus lacustris 53
Gadus longipes 83
Gadus lubb 29
Gadus lycostomus 70
Gadus macrocephalus 42
Gadus maculosa 53
Gadus melanostomus 61
Gadus merlangus euxinus 56
Gadus merlangus merlangus 56
Gadus minimus 73
Gadus minor 75
Gadus morhua 44
Gadus morhua kildinensis 44
Gadus morhua macrocephalus 42
Gadus morhua maris-albi 47
Gadus morhua morhua 44
Gadus morhua ogac 47
Gadus nanus 44
Gadus ogac 47
Gadus ogat 47
Gadus ovak 47
Gadus periscopus 75
Gadus polymorphus 58
Gadus potassoa 61
Gadus poutassou 61
Gadus pruinosus 58
Gadus punctatus 87
Gadus purpureus 71
Gadus pygmaeus 42
Gadus raninus 73
Gadus raptor 64
Gadus ruber 44,339
Gadus rupestris 44
Gadus sey 71
Gadus tacaud 80
Gadus tomcod fuscus 58
Gadus tomcod luteus 58
Gadus tomcodus mixtus 58
Gadus torsk 29
Gadus tricirratus 50
Gadus tricirratus 51

Gadus trifurcus 73
Gadus (Trisopterus) capelanus 80
Gadus viridis 70
Gadus wachna 34
Gaffelkabeljauw 67
Gaidouropsaro 51
Gaidropsarus 48
Gaidropsarus argentatus 49
Gaidropsarus barbatus 49
Gaidropsarus biscayensis 49
Gaidropsarus capensis 49
Gaidropsarus cimbrius 38
Gaidropsarus ensis 49
Gaidropsarus granti 49
Gaidropsarus guttatus 49
Gaidropsarus insularum 49
Gaidropsarus macrophthalmus 50
Gaidropsarus macropththalmus 49
Gaidropsarus mediterraneus 49
Gaidropsarus mediterraneus 50
Gaidropsarus mustela 32
Gaidropsarus mustellaris 50
Gaidropsarus novaezelandiae 49
Gaidropsarus pacificus 49
Gaidropsarus parini 49
Gaidropsarus septentrionalis 33
Gaidropsarus tricirratus 51
Gaidropsarus vulgaris 49
Gaidropsarus vulgaris 51
Galea 51
Galja 51,52
Garichthys 111
Garichthys fasciatus 156
garmani, Lionurus (Nezumia) 300
garmani, Ventrifossa 300
garretti, Bathygadus 94
gayi australis, Merluccius 332
gayi, Epicopus 336
gayi hubbsi, Merluccius 332, 337
gayi, Merluccius 331,332,336,337
gayi polylepis, Merluccius 332
Gelincik 51,65,67,69
Ghost rattail 208
Ghrab 370
Giant grenadier 110,111
gibber, Sphagemacrurus 288
gigas, Coryphaenoides 205
gigas, Nematonurus 205
gilberti, Coelorinchus 138
gilchristi, Tripterophycis 378
glacialis, Arctogadus 26
gladius, Coelorinchus 138
Glafkopontikopsaro 64
Glasshead grenadier 230
glauca, Couchia 32
glauca, Ciliata 32
globiceps, Laemonema 361
globosus, Momonatira 368
gmelini, Batrachoides 66
goethemi, Bathygadus 94
goodei, Hymenocephalus 205
goodei, Macrurus (Hymenocephalus) 205
goodei, Nematonurus 205
goodii, Macrurus 205
Googly eyed cod 370
Gourlomata 62
gracilis, Eleginus 34
gracilis, Eleginus navaga 34
gracilis, Hymenocephalus (H.) 230
gracilis, Melanonus 318
gracillicauda, Macrurus 286
gracillicauda, Nezumia 286
gracillipes, Laemonema 361
Granadero 151,238
Granadero acorazado 154
Granadero carminífero 206
Granadero de Marini 172
Granadero dentón 223
Granadero pichirata 209
Granaderos 90
Grande lingue 64
grandis, Lotella 374
granti, Gaidropsarus 49
Grasej 72
Grazniak 71
Greater fork beard 67
Greater forkbeard 66
Greenland cod 47,48
grenadae, Sphagemacrurus 289
Grenadero del Cabo 324
Grenadier à long nez 155
Grenadier barbu 242
Grenadier berglax 236
Grenadier bleu 326
Grenadier carmin 206
Grenadier cod 378,379
Grenadier de Marini 172
Grenadier dente 223
Grenadier du cap 324
Grenadier Patagonien 325
Grenadier pichirat 209
Grenadier raton 154
Roughsnout grenadier 316
Grenadier scie 243
Grenadiers 90
Grenurus 287
Greslin 72
Grey grenadier 317
grimaldii, Hymenocephalus (H.) 230
grinnelli, Physiculus 370
Grönland dorsch 48
Gros poutassou 62
guentheri, Chalinura 210
guentheri, Coryphaenoides 210
guentheri, Coryphaenoides (Macrurus) 210
guentheri, Lepidion 364
guentheri, Macruroplus 210
guentheri, Macrurus 210
Guidon 79
Guinean codling 362
Guitan moulek 79
Gulf hake 85
Günther's grenadier 210
guntheri, Lionurus 210
guttatus, Gaidropsarus 49
guttatus, Onus 339

H

Habillot 55
hachijoensis, Hymenocephalus (H.) striatissimus 230
Haddock 54,55,334
Hake 40,334
Hakes 319
Halargyreus 360
Halargyreus affinis 360
Halargyreus brevipes 360
Halargyreus johnsonii 360
Haloporphyrus lepidion 366
Haloporphyrus viola 354
Hana sokodara 217
Hawaiian grenadier 297
hawaiiensis, Malacocephalus (M.) 241
Hawknose grenadier 177
hebetata, Nezumia 263
Hechtdorsch 340
helenaensis, Physiculus 370
helolepis, Trachyrincus 315
Hemimacrurus 183
Hemimacrurus acrolepis 202
Heri dara 215
hernandezi, Merluccius 330
Herring hake 340
heteroglossus, Gadus 44
heterolepis, Hymenocephalus (H.) 230
hexfasciatus, Coelorinchus 159
hextii, Coryphaenoides (C.) 201
Hidronus marlucius 339
hige, Coelorinchus 138
Higo sokodara 282
hildebrandi, Nezumia 264
Himodara 212
hirundo, Sphagemacrurus 288
hispidus, Macrurus (Chalinurus) 310
Hoka 374
Hoki 327
Hollowsnout grenadier 154
holocentra, Nezumia 263
holotrachys, Coryphaenoides 236
holotrachys, Macrourus 236,237,238
holotrachys, Macrurus 210,235,264
Homaehige 308
Homalopomus trowbridgii 342
hoskynii, Coryphaenoides (C.) 201
houdei, Bregmaceros 16
Huaica 325
Hualca 325
Huaycuya 337
hubbsi, Coelorinchus 138
hubbsi, Merluccius gayi 332,337
hubbsi, Merluccius merluccius 337
hubbsi, Merluccius 337
Huilca 325
huloti, Physiculus 370
Humboldt grenadier 204
hutchinsi, Eeyorius 357
Hvilling 57
Hymenocephalus 224
Hymenocephalus goodei 205
Hymenocephalus (H.) antraeus 230
Hymenocephalus (H.) billsamorum 230
Hymenocephalus (H.) gracilis 230
Hymenocephalus (H.) grimaldii 230
Hymenocephalus (H.) heterolepis 230
Hymenocephalus (H.) lethonemus 230
Hymenocephalus (H.) longibarbis 230
Hymenocephalus (H.) longiceps 230
Hymenocephalus (H.) longipes 230
Hymenocephalus (H.) nascens 230
Hymenocephalus (H.) striatissimus 230
Hymenocephalus (H.) striatissimus aeger 230
Hymenocephalus (H.) striatissimus hachijoensis 230
Hymenocephalus (H.) striatissimus torvus 230
Hymenocephalus (H.) striatulus 230
Hymenocephalus (H.) tenuis 230
Hymenocephalus italicus 230
Hymenocephalus (P.) aterrimus 230
Hymenocephalus (P.) barbatulus 230
Hymenocephalus (P.) papyraceus 230
Hymenocephalus (S.) kuronumai 230
Hyse 55

I

Ibarahige 203
Ichimonji hige 165
Idiolophorhynchus andriashevi 313
imberbis, Gadella 358
infranudis, Nezumia 263
ingolfi, Coryphaenoides 210
ingolfi, Macrurus 210
innotabilis, Coelorinchus 161,163
inornata, Lota 53
inosimae, Lepidion 364
insularum, Gaidropsarus 49
intermedius, Coelorhynchus 158
intermedius, Tripterophycis 378
introniger, Gadomus 97
investigatoris, Nezumia 263
italicus, Hymenocephalus 230
italicus, Macrurus 230
italicus, Macrurus (Mystaconurus) 230
Itaria-sujidara 231
Itohiki-dara 363

J

jago, Raniceps 73
Japanese codling 372
Japanese grenadier 162
japonica, Physiculus 370,372
japonica, Ventrifossa 296
japonicus, Bregmaceros 16
japonicus, Coelorhynchus 162,174
japonicus, Coelorinchus 162
japonicus, Macrurus 168
japonicus, Physiculus 372
Javelin 146
Javelin fish 232
johnboborum, Ventrifossa 296
johnsonii, Halargyreus 360
joptera, Lotta 366
jordani, Coelorinchus 138

jordani, Gadella 358
jubatus, Gadus 50
Julienne 65

K

Kabel jauw 47
Kabeljau 47
Kaiwi Channel grenadier 281
kaiyomaru, Coelorinchus 163
Kalja 55
kamensis, Lota lota 53
Kamohara grenadier 164
kamoharai, Coelorinchus 164
kamoharai, Nezumia 263
Kapelan 80
karaensis, Eleginus navaga 36
Karafutosokodara 208
Karibu hige 152
Karrer's whiptail 166
karrerae, Coelorinchus 166
karrerae, Physiculus 370
kaupi, Physiculus 370
kermadecus, Coelorinchus 138
Kharraye mouassata 67
Kiankiarquia 79
kildinensis, Gadus callarias 44
kildinensis, Gadus morhua 44
kishinouyei, Coelorinchus 167
Köhler 72
Kolja 55
Kolmule blagunnar 62
kongi, Laemonema 361
Koolvis 72
Kuller 55
Kulmule 340
Kummel 340
Kummeli 340
Kumrill 67
kuronumai, Hymenocephalus (S.) 230

L

labiatus, Coelorhynchus 168
labiatus, Coelorinchus 168
labiatus, Oxygadus 168
lacustris, Gadus 53
Laemonema 361
Laemonema barbatulum 361
Laemonema compressicauda 361
Laemonema curtipes 361
Laemonema filodorsale 361
Laemonema globiceps 361
Laemonema gracillipes 361
Laemonema kongi 361
Laemonema latifrons 361
Laemonema laureysi 362
Laemonema longifilis 82
Laemonema longipes 363
Laemonema melanurum 361
Laemonema modesta 361
Laemonema morosum 363
Laemonema nana 361
Laemonema rhodochir 361
Laemonema robustum 361
Laemonema verecunda 361
Laemonema yarrellii 361
Laemonema yuvto 361
laevis, Macrurus (Malacocephalus) 242
laevis, Malacocepahlus 230
laevis, Malacocephalus 242
Laibeque 51
Lakuriq 62
lanatus, Merlucius 339
lanceolatus, Bregmaceros 16
Langa 65
Lange 65
Langschwanz Seehecht 327
Largenose grenadier 216
Lasposaloúvardos 67
latifrons, Laemonema 361
latinasutus, Coryphaenoides 203
latinasutus, Lionurus 203
latinasutus, Macrurus 203
latirostrata, Nezumia 272
latirostratus, Lionurus (Nezumia) 272
laureysi, Laemonema 362
Lawyer 54
Lécaud 57
lecointei, Coryphaenoides (N.) 201
Leng 65
Lengua de bacalá 65
leonis, Nezumia 263
Lepidion 363
Lepidion capensis 364
Lepidion ensiferus 364
Lepidion eques 365
Lepidion guentheri 364
lepidion, Haloporphyrus 366
Lepidion inosimae 364
lepidion, Lepidion 366
Lepidion lepidion 366
lepidion, Lotta 366
Lepidion microcephalus 364
Lepidion natalensis 364
Lepidion rissoi 366
Lepidion rubescens 366
Lepidion schmidti 364
Lepidoleprus 313
Lepidoleprus norvegicus 217
Lepidoleprus trachyrincus 316
Lepidorhynchus 231
Lepidorhynchus denticulatus 232
Lepidosoma 313
leptolepis, Coryphaenoides (C.) 201
leptura, Lota lota 53
lethonemus, Hymenocephalus (H.) 230
Lieu de l'Alaska 75
Lieu de Norvège 76
Lieu jaune 70,71
Lieu noir 71,72
limbatus, Phycis 68
Linarda 64
Ling 54,64,65
Lingue 65
Lingue batarde 64
Lingue bleue 63,64
Lingue espagnole 64

Lingue franche 65
linnei, Aeglefinus 54
linnei, Lota 53
linnei, Merlangus 56
linnei, Merluccius 339
linnei, Molva 64
linnei, Pollachius 70
liocephalus, Coryphaenoides (C.) 201
liolepis, Lionurus 274
liolepis, Lionurus (Lionurus) 274
liolepis, Nezumia 274
Lionurus abei 281
Lionurus guntheri 210
Lionurus latinasutus 203
Lionurus liolepis 274
Lionurus (Lionurus) barbiger 274
Lionurus (Lionurus) liolepis 274
Lionurus (Nezumia) aequalis 264
Lionurus (Nezumia) atherodon 296
Lionurus (Nezumia) bairdii 266
Lionurus (Nezumia) condylura 269
Lionurus (Nezumia) convergens 270
Lionurus (Nezumia) ctenomelas 297
Lionurus (Nezumia) cuspidatus 270
Lionurus (Nezumia) garmani 300
Lionurus (Nezumia) latirostratus 272
Lionurus (Nezumia) loricatus 275
Lionurus (Nezumia) misakius 304
Lionurus (Nezumia) occidentalis 243
Lionurus (Nezumia) orbitalis 279
Lionurus (Nezumia) pulchella 282
Lionurus (Nezumia) sclerorhynchus 284
Lionurus (Nezumia) stelgidolepis 286
Lionurus (Nezumia) trichiurus 270
Lionurus nigromaculatus 309
Lionurus propinquus 280
Lionurus proximus 281
Lionurus stelgidolepis 286
Lipp 65
Lipp abjad 67
Lipp tal qawwi 69
liraticeps, Coryphaenoides 203
liraticeps, Macrurus 203
Locha blanca 88
Locha de Florida 86
Locha regia 87
Locha roja 83
Loche 67
Lom 31
Lompje 32
Long rayed whiptail 221
Longarm grenadier 171
Longbeard grenadier 301
longebarbata, Nezumia 263
longebarbata, Ventrifossa 296
Longfin codling 363
Longfin grenadier 211
Longfin hake 67,68
Longhead grenadier 169
longibarbis, Hymenocephalus (H.) 230
longicavis, Physiculus 370
longicephalus, Coelorinchus 169
longiceps, Hymenocephalus (H.) 230
longicirrhus, Coryphaenoides (C.) 201
longifilis, Coryphaenoides 211
longifilis, Coryphaenoides (Nematonurus) 211
longifilis, Dolloa 211
longifilis, Gadomus 97
longifilis, Laemonema 82
longifilis, Macrourus (Nematonurus) 211
longifilis, Moseleya 211
longifilis, Nematonurus 211
longifilis, Physiculus 370
longipes, Bregmaceros 16
longipes, Gadus 83
longipes, Hymenocephalus (H.) 230
longipes, Laemonema 363
longipes, Podonema 363
longipes, Podonematichthys 363
longirostris, Trachyrincus 313
longissimus, Coelorinchus 138
Longnose grenadier 155
Longnose rattail 161
Longrayed whiptail 220
Longue barbe 67
Loosescale grenadier 203
loricata, Nezumia 275
loricatus, Lionurus (Nezumia) 275
Lota 51,52
Lota brosmina 53
Lota compressa 53
Lota de río 53
lota leptura, Lota 53
lota lota, Enchelyopus 53
Lota inornata 53
lota kamensis, Lota 53
Lota linnei 53
Lota lota 53
Lota lota kamensis 53
Lota lota leptura 53
lota, Lota lota 53
lota lota, Lota 53
Lota lota lota 53
Lota lota maculosa 53
Lota maculosa 53
lota maculosa, Lota 53
Lota mola 64
lota, Molva 53
Lota vulgaris 53
Lota vulgaris obensis 53
Lotella 367
Lotella bachus 373
Lotella fernandeziana 368
Lotella grandis 374
Lotella rhacinus 368
Lotella tosaensis 368
Lotta joptera 366
Lotta lepidion 366
Lotte de rivière 53
Lubb 31
lubb, Gadus 29
Lubbe 71
lucifer, Ventrifossa 296
Lumb 31
luminosa, Physiculus 370
Luminous hake 345
Lupacz 55
lusca, Morhua 79
luscus, Gadulus 79
luscus, Trisopterus 79

Lush 54
luteus, Gadus tomcod 58
luzonensis, Malacocephalus (M.) 241
Lyconus 322
Lyconus brachycolus 322
lycostomus, Gadus 70
Lyr 71
Lyrtorsk 71
Lysing 340
Lysingur 340
Lythe 71
Lyusca 79

M

Ma-dara 44
macrocephalus, Coryphaenoides 212
macrocephalus, Coryphaenoides (Coryphaenoides) 212
macrocephalus, Gadus 42
macrocephalus, Gadus morhua 42
macrocephalus, Gadus callarias 42
macrocephalus morhua, Gadus 42
macrochir, Abyssicola 171
macrochir, Coelorhynchus (Abyssicola) 171
macrochir, Coelorinchus 171
macrochir, Macrurus (Malacocephalus) 171
macrolepis, Coelorinchus 138
macrolophus, Coryphaenoides (C.) 201
macronema, Nezumia 263
macrophthalmus, Antonogadus 50
macrophthalmus, Gaidropsarus 50
macropogon, Ventrifossa 301
macrops, Bathygadus 94
macroptera, Ventrifossa 303
macropththalmus, Gaidropsarus 49
macrorhynchus, Coelorinchus 138
MACROURIDAE 90
MACROURINAE 98
MACROUROIDINAE 311
Macrourus 233
Macrourus asper 304
Macrourus berglax 235
Macrourus carinatus 236
Macrourus cinereus 207
Macrourus holotrachys 236,237,238
Macrourus nasutus 281
Macrourus (Nematonurus) longifilis 211
Macrourus rupestris 154,235
Macrourus stroemii 217
Macrourus whitsoni 238
Macruronus 322
Macruronus argentinae 325
Macruronus capensis 324
Macruronus magellanicus 325
Macruronus novae-zelandiae 325
Macruronus novaezelandiae 326
Macruroplus 248
Macruroplus brevibarbatus 267
Macruroplus guentheri 210
Macruroplus nasutus 306
Macruroplus potronus 309
Macruroplus pudens 282
Macruroplus sclerorhynchus 284
Macruroplus serratus 264
Macruroplus violaceus 243,284
Macrurus aequalis 264
Macrurus asper 205
Macrurus australis 146,147
Macrurus barbiger 274
Macrurus carinatus 236
Macrurus (Chalinurus) hispidus 310
Macrurus coelorhynchus 154
Macrurus (Coelorhynchus) australis 147
Macrurus (Coelorhynchus) canus 150
Macrurus (Coelorhynchus) coelorhynchus 154
Macrurus (Coelorhynchus) fasciatus 156
Macrurus (Coelorhynchus) parallelus 149
Macrurus (Coelorhynchus) parallelus 178
Macrurus (Coelorhynchus) talismani 168
Macrurus (Coryphaenoides) rupestris 217
Macrurus (Coryphaenoides) serrulatus 219
Macrurus cuspidatus 270
Macrurus cyclolepis 205
Macrurus fabricii 235
Macrurus firmisquamis 202
Macrurus goodii 205
Macrurus gracillicauda 286
Macrurus guentheri 210
Macrurus holotrachys 210,235,264
Macrurus (Hymenocephalus) goodei 205
Macrurus ingolfi 210
Macrurus italicus 230
Macrurus japonicus 168
Macrurus latinasutus 203
Macrurus liraticeps 203
Macrurus (Macrurus) petersonii 310
Macrurus (Malacocephalus) laevis 242
Macrurus (Malacocephalus) macrochir 171
Macrurus (Malacocephalus) sulcatus 290
Macrurus (Mystaconurus) italicus 230
Macrurus nasutus 216
Macrurus (Nematonurus) magnus 110
Macrurus (Nematonurus) armatus 205
Macrurus (Nematonurus) suborbitalis 205
Macrurus norvegicus 217
Macrurus (Optonurus) denticulatus 232
Macrurus parallelus 149
Macrurus rupestris 217
Macrurus sclerorhynchus 210
Macrurus serratus 264
Macrurus smiliophorus 264
Macrurus trachyrhynchus 316
Macrurus trichiurus 270
Macrurus violaceus 284
maculata, Onos 51
maculatus, Coelorinchus 138
maculosa, Gadus 53
maculosa, Lota 53
maculosa, Lota lota 53
maculosa, Molva 53
magellanicus, Macruronus 325
magnifilis, Gadomus 97
magnoculus, Merluccius 330
magnus, Macrurus (Nematonurus) 110
Mahia 111
Mahia rattail 174
Mahia whiptail 173
Malacocepahlus laevis 230
Malacocephalus 240

Malacocephalus laevis 242
Malacocephalus (M.) hawaiiensis 241
Malacocephalus (M.) luzonensis 241
Malacocephalus (M.) nipponensis 241
Malacocephalus occidentalis 243
Malacocephalus (P.) boretzi 241
Malacocephalus (P.) okamurai 241
Malacocephalus (Pawnurus) occidentalis 243
Malactos 67
Maltona 334
Mankana 80
Mantiz morski 65
maraldi, Gadella 359
maraldi, Merluccius 359
maraldi, Uraleptus 358,359
Marbled moray cod 381
marginata, Austrophycis 356
marginatus, Coryphaenoides 214
marginatus, Phycis 83
marginatus, Physiculus 356
Maria 54
marina, Tinca 68
Marini's grenadier 172
marinii, Coelorhynchus coelorhynchus 172
marinii, Coelorinchus 172
maris-albi, Gadus callarius 47
maris-albi, Gadus morhua 47
marisrubri, Physiculus 370
Marlin spike 267
Marlin spike grenadier 266
Marloz 340
marlucius, Hidronus 339
marmoratus, Muraenolepis 381
Marmota 336,340,341,342
maroccanus, Trachinoides 339
marshalli, Coryphaenoides (C.) 201
Maruca 64,65
Maruca azul 63
Mataeocephalus 244
Mataeocephalus acipenserinus 246
Mataeocephalus adustus 245
Mataeocephalus microstomus 245
Mataeocephalus nigrescens 245
Mataeocephalus tenuicauda 247
matamua, Coelorinchus 173
matsubarai, Coelorinchus 138
mcclellandi, Bregmaceros 16,17
meadi, Antimora 354
mediterranea, Mora 369
mediterranea, Motella 50
Mediterranean bigeye rockling 49
Mediterranean codling 366
mediterraneus, Coryphaenoides (C.) 201
mediterraneus, Enchelyopus 50
mediterraneus, Gaidropsarus 49,50
mediterraneus, Onos 50
mediterraneus, Phycis 68
Medzid 57
megalokynodon, Antonogadus 49
megalokynodon, Motella 49
megalops, Austrophycis 356
megalops, Phocaegadus 26
Melanobranchus 93
melanobranchus, Bathygadus 95
Melanogrammus 54
Melanogrammus aeglefinus 54
MELANONIDAE 318
Melanonus 318
Melanonus gracilis 318
Melanonus zugmayeri 318
melanopterus, Gadomus 97
melanostomus, Gadus 61
melanurum, Laemonema 361
Melu 62
Menek 31
Menyok 31,56
Merlan 57
Merlan argenté 39
Merlan bleu 61,62
Merlan bleu austral 60
Merlan de Paris 62
Merlan vert 72
Merlana 57
Merlangius 55
Merlangius (Huttonichthys) australis 332
Merlangius merlangus 56
Merlangius merlangus euxinus 56
Merlangius merlangus merlangus 56
Merlango 337
Merlangus albus 61
Merlangus argenteus 39
Merlangus carbonarius 71
Merlangus communis 50,61
merlangus euxinus, Gadus 56
merlangus euxinus, Merlangius 56
merlangus euxinus, Odontogadus 56
merlangus merlangus, Gadus 56
merlangus, Gadus merlangus 56
Merlangus, linnei 56
merlangus, Merlangius 56
merlangus, Merlangius merlangus 56
merlangus merlangus, Merlangius 56
merlangus merlangus, Odontogadus 56
merlangus, Odontogadus merlangus 56
Merlangus pertusis 61
Merlangus polaris 27
Merlangus pollachius 70
Merlangus purpureus 71
Merlangus vernalis 61
Merlangus virens 71
Merlangus vulgaris 56
Merlano 57
Merlin 57
Merlu 57,331,340,342,344
Merlu argenté 334
Merlu argenté du large de l'Atlantique NO 330
Merlu austral 332
Merlu d'Afrique tropicale 341
Merlu d'Argentine 337
Merlu du Cap 335
Merlu du Chili 336
Merlu du Pacifique nord 342
Merlu du Panama 331
Merlu du Sénégal 343
Merlu européen 339
MERLUCCIIDAE 319
Merluccius 327
Merluccius albidus 330
Merluccius ambiguous 359

Merluccius angusticeps 331
Merluccius angustimanus 331
Merluccius argentatus 339
Merluccius attenuatus 359
Merluccius australis 332
Merluccius bilinearis 330,334,337
Merluccius cadenati 341
merluccius cadenati, Merluccius 339
Merluccius capensis 335
merluccius capensis, Merluccius 335
Merluccius gayi 331
Merluccius gayi 332,336,337
Merluccius gayi australis 332
Merluccius gayi hubbsi 332,337
Merluccius gayi polylepis 332
Merluccius hernandezi 330
Merluccius hubbsi 337
Merluccius linnei 339
Merluccius magnoculus 330
Merluccius maraldi 359
merluccius, Merluccius 339
Merluccius merluccius 339
Merluccius merluccius cadenati 341
Merluccius merluccius capensis 335
Merluccius merluccius hubbsi 337
Merluccius merluccius paradoxus 340
Merluccius merluccius polli 341
Merluccius merluccius senegalensis 343
Merluccius paradoxus 340
merluccius paradoxus, Merluccius 340
Merluccius polli 341
merluccius polli, Merluccius 341
Merluccius polylepis 332
Merluccius productus 342
Merluccius senegalensis 343
merluccius senegalensis, Merluccius 343
Merluccius smiridus 339
Merluccius vulgaris 330,334,339
Merluche 72,340
Merluche à longues nageoires 67,68
Merluche blanche 71,88
Merluche écureuil 83
Merluchón 340
Merlucius ambiguus 339
Merlucius esculentus 339
Merlucius lanatus 339
Merlucius sinuatus 339
Merlucius uraleptus 359
Merlus 319
Merlutso 80
Merluza 331,332,337,339, 340,343
Merluza Argentina 337
Merluza austral 332,334,339
Merluza azul 327
Merluza blanca de altura 330
Merluza Chilena 336
Merluza cola de rata 325
Merluza de Benguela 341
Merluza de cola 325
Merluza de tres aletas 61
Merluza del Cabo 335
Merluza del Pacifico Norte 342
Merluza del sur 334
Merluza española 334
Merluza europea 339
Merluza Norteamericana 334
Merluza panameña 331
Merluza senegalesa 343
Merluzas 319
Merluzovye 340
Merluzy 340
Merluzzetto 80
Merluzzetto bruno 79
Merluzzo 340
Merluzzo giallo 71
Merluzzo nero 72
Methy 54
Mexican grenadier 215
mexicanus, Coryphaenoides 215
Mezgit 57
microcephalus, Lepidion 364
microcephalus, Muraenolepis 382
Microgadus 57
Microgadus proximus 58
Microgadus tomcod 58
microlepis, Antimora 353
Micromesistius 60
Micromesistius australis 60
Micromesistius australis australis 60
Micromesistius australis pallidus 60
Micromesistius poutassou 61
micronemus, Bathygadus 94
micronychodon, Nezumia 276
microps, Coryphaenoides (C.) 201
microps, Muraenolepis 383
microstomus, Mataeocephalus 245
Miller's grenadier 278
milleri, Nezumia 278
minimus, Gadus 73
minor, Couchia 32
minor, Gadus 75
Mintai 76
minutus, Brachygadus 80
minutus capelanus, Trisopterus 80
minutus, Gadulus 80
minutus minutus, Trisopterus 80
minutus, Trisopterus 80
mirus, Coelorinchus 138
Misaki grenadier 304
Misaki sokodara 305
misakia, Ventrifossa 304
misakius, Lionurus (Nezumia) 304
mixtus, Gadus tomcodus 58
modesta, Laemonema 361
Moille 67
mola, Lota 64
Mollera 80
Mollera azul 354
Mollera moranella 369
Mollera pigada 67
Móllera roquera 69
Molo 57
molokaiensis, Gadella 358
Molva 63,65
Molva abyssorum 63
Molva byrkelange 63
Molva dipterygia 63
Molva dipterygia dipterygia 63
Molva dypterygia 63

Molva linnei 64
Molva lota 53
Molva maculosa 53
molva, Molva 64
Molva molva 64
Molva occhiona 64
Molva vulgaris 64
Molvella borealis 32
Molwa 65
Molwa nibieska 64
Momonatira 368
Momonatira globosus 368
Momonatira paulini 368
Mora 369
Mora dannevigi 369
Mora mediterranea 369
Mora moro 369
Mora pacifica 369
Moras 346
Moray cods 380
Morhua aeglefinus 54
Morhua barbata 79
morhua, Gadus 44
morhua, Gadus morhua 44
morhua kildinensis, Gadus 44
Morhua lusca 79
morhua macrocephalus, Gadus 42
morhua maris-albi, Gadus 47
morhua morhua, Gadus 44
morhua ogac, Gadus 47
Morhua punctata 44
Morhua vulgaris 44
MORIDAE 346
Mormoro 80
Moro 370
Moro commun 369
moro, Mora 369
Moros 346
morosum, Laemonema 363
Morrhua americana 44
Morrhua californica 58
Morrhua proxima 58
Morrhua pruinosa 58
Morrhua tomcodus 58
Morskoy nalim 51
Morszczuk 340
mortoni, Coelorhynchus 146
Morue 47
Morue arctique 26,36
Morue boréale 34
Morue de l'Atlantique 45
Morue du Pacifique 42
Morue lingue 65
Morue ogac 47
Morue polaire 27
Morva capelanus 80
Moseleya 183
Moseleya cyclolepis 205
Moseleya longifilis 211
Mostela 67
Mostelle de fond 67,78
Mostelle de roche 69
Mostia kabirah 67
Mostia saghirah 69
Motele me mustaqe 51
Motella caudacuta 38
Motella cimbrica 38
Motella communis 50
Motella (Couchia) argenteola 32
Motella fusca 50
Motella maculata 52
Motella mediterranea 50,51
Motella megalokynodon 49
Motella mustela 32
Motella tricirrata 51
Motella vulgaris 51
Motelle 49
Motelle à cinq barbillons 32
Motelle à quatre barbillons 38
Motelle à trois barbillons 51
Motelle commune 51,52
Motelle de Méditerranée 50
Moustela de rocas 69
Moustelle 67
Moustelo blanco 67
Moustelo de roco 67
mucocephalus, Ventrifossa 305
Mud hake 89
Mugura grenadier 167
Mugura hige 168
multifilis, Gadomus 97
multispinulosus, Coelorinchus 174
Munedara 111
MURAENOLEPIDIDAE 380
Muraenolepis 380
Muraenolepis marmoratus 381
Muraenolepis microcephalus 382
Muraenolepis microps 383
Muraenolepis orangiensis 384
Murluts 57
murrayi, Trachyrincus 313
murrayi, Coryphaenoides (C.) 201
Musdea 67,69
Musdea bianca 67
Musdea Bianca 69
Musdea nera 371
mustela, Ciliata 32
Mustela de fundu 67
mustela, Enchelyopus 32
Mustela fusca 50
mustela, Gaidropsarus 32
mustela, Motella 32
mustela, Onos 32
Mustella 67
mustella, Onos 50
mustellaris, Gaidropsarus 50
Musuji sokodara 160
myersi, Coryphaenoides (C.) 201
Mystaconurus 224

N

namatahi, Nezumia 263
nana, Laemonema 361
nanus, Gadus 44
Nasalli 340
nascens, Hymenocephalus (H.) 230
Nasello 340
Nasello azzurro 327

Nasellu 57
Nasellu 62
nasuta, Ventrifossa 306
nasutus, Coryphaenoides 216
nasutus, Macrourus 281
nasutus, Macruroplus 306
nasutus, Macrurus 216
natalensis, Coelorhynchus (Paramacrurus) 155
natalensis, Lepidion 364
natalensis, Physiculus 370
Navaga 36,37
navaga, Eleginus 36
navaga, Eleginus navaga 36
nava gracilis, Eleginus 34
nava karaensis, Eleginus 34
Nazalli 57,80
Nazalli azraq 62
Nazelli 62,340,80
nectabanus, Bregmaceros 16
Nematonurus abyssorum 205
Nematonurus acrolepis 202
Nematonurus armatus 205
Nematonurus gigas 205
Nematonurus goodei 205
Nematonurus longifilis 211
Nematonurus pectoralis 110
Nematonurus sp. aff. *altipinnis* 209
Nematonurus suborbitalis 205
nematopus, Physiculus 370
Nemusa 40
neonectabanus, Bregmaceros 16
New Zealand whiptail 327
Nezumi-dara 270
Nezumia 248
Nezumia aequalis 264
Nezumia africana 263
Nezumia atlantica 265
Nezumia bairdi 266
Nezumia brevibarbata 267
Nezumia brevibarbatus 267
Nezumia brevirostris 263
Nezumia bubonis 263
Nezumia burragei 263
Nezumia condylura 269
Nezumia convergens 270
Nezumia cuspidata 270
Nezumia cyrano 263
Nezumia dara 263
Nezumia duodecim 271
Nezumia ectenes 263
Nezumia evides 263
Nezumia gracillicauda 286
Nezumia hebetata 263
Nezumia hige 142
Nezumia hildebrandi 264
Nezumia holocentra 263
Nezumia infranudis 263
Nezumia investigatoris 263
Nezumia kamoharai 263
Nezumia latirostrata 272
Nezumia leonis 263
Nezumia liolepis 274
Nezumia (Lionurus) aequalis 264
Nezumia longebarbata 263
Nezumia loricata 275
Nezumia macronema 263
Nezumia micronychodon 276
Nezumia milleri 278
Nezumia namatahi 263
Nezumia nigromaculata 309
Nezumia obliquata 263
Nezumia orbitalis 279
Nezumia parini 263
Nezumia polylepis 263
Nezumia propinqua 280
Nezumia propinquus 280
Nezumia proxima 281
Nezumia proximus 281
Nezumia pudens 282
Nezumia pulchella 283
Nezumia sclerorhynchus 284
Nezumia semiquincunciata 263
Nezumia spinosa 263
Nezumia stegidolepis 286
Nezumia stelgidolepis 286
Nezumia suilla 263
Nezumia tinro 263
Nezumia toi 263
Nezumia tomiyamai 263
Nezumia trichiura 270
Nezumia ventralis 263
niger, Raniceps 73
nigrescens, Mataeocephalus 245
nigrescens, Physiculus 370
nigripinnis, Physiculus 371
nigrodorsalis, Ventrifossa 307
nigromaculata, Nezumia 309
nigromaculata, Ventrifossa 309
nigromaculata, Ventrifossa (Lucigadus) 309
nigromaculatus, Lionurus 309
nigromarginata, Ventrifossa 296
nipponensis, Malacocephalus (M.) 241
nipponicus, Bathygadus 94
Nishi nezumidara 266
Nishi toujin 177
Nordisk Tangbrosme 33
normani, Physiculus 371
norops, Gadella 358
North Atlantic codling 365
North Pacific hake 342
Northern bastard codling 375
Northern bastard red cod 376
Northern rockling 33
norvegicus, Coryphaenoides 217
norvegicus, Lepidoleprus 217
norvegicus, Macrurus 217
Norway pout 77,78
Norwegian pollock 76
Notable whiptail 161
notatus, Coelorinchus 138
novaezelandiae, Gaidropsarus 49
novae-zelandiae, Macruronus 325
novaezelandiae, Macruronus 326

O

obensis, Lota vulgaris 53
obliquata, Nezumia 263
obscurus, Gadella 358

Obyknovenniy niteperiy nalim 69
occa, Coelorhynchus 176
occa, Coelorhynchus (Oxygadus) 176
occa, Coelorinchus 176
occa, Oxygadus 176
occidentalis, Chalinura 243
occidentalis, Lionurus (Nezumia) 243
occidentalis, Malacocephalus 243
occidentalis, Malacocephalus (Pawnurus) 243
occidentalis, Ventrifossa (Ventrifossa) 243
Odontogadus merlangus euxinus 56
Odontogadus merlangus merlangus 56
Officier 79
Offshore hake 330
Offshore silver hake 331
Ogac 48
ogac, Gadus 47
ogac, Gadus morhua 47
ogat, Gadus 47
Ogerpal 78
okamurai, Malacocephalus (P.) 241
oliverianus, Coelorinchus 147
oliverianus, Coelorinchus 177
Onion eye 236
Onion eye grenadier 235
Onos fusca 50
Onos maculata 51
Onos mediterraneus 50
Onos mustela 32
Onos mustella 50
Onos sellai 50
Onos septentrionalis 33
Onos tricirratus 51
Onos vulgaris 51
Onus carpenteri 50
Onus guttatus 339
Onus macrophthalmus 50
Onus riali 339
Optonurus 231
Optonurus, denticulatus 232
orangiensis, Muraenolepis 384
orbitalis, Lionurus (Nezumia) 279
orbitalis, Nezumia 279
oreinos, Coryphaenoides (C.) 20
ori, Ventrifossa 296
orthogrammus, Coryphaenoides (C.) 201
Oslic 340
ovak, Gadus 47
Oxycephas 313
Oxygadus labiatus 168
Oxygadus occa 176

P

Pacific cod 42,44
Pacific grenadier 202,203
Pacific hake 343
Pacific tomcod 58
pacificus, Gaidropsarus 49
Paddetorsk 74
Palau grenadier 303
pallidus, Micromesistius australis 60
Panama hake 331
papyraceus, Hymenocephalus (P.) 230
paradoxus, Coryphaenoides (C.) 201
paradoxus, Merluccius 340
paradoxus, Merluccius merluccius 340
parallelus, Coelorhynchus 149
parallelus, Coelorhynchus 164
parallelus, Coelorinchus 178
parallelus, Macrurus 149
parallelus, Macrurus (Coelorhynchus) 149
parallelus, Macrurus (Coelorhynchus) 178
Paramacrurus 11
paramarshalli, Coryphaenoides (C.) 201
Parao sokodara 303
parini, Gaidropsarus 49
parini, Nezumia 263
Parrot grenadier 275
Pastenula 67
Patafloues 62
Patagonia sokodara 238
patagoniae, Coelorhynchus 140
patagoniae, Coelorhynchus 156
patagoniae, Coelorhynchus (Coelorhynchus) 156
Patagonian codling 364
Patagonian grenadier 325
Patagonian moray cod 384
paulini, Momonatira 368
pearyi, Boreogadus 25
Pectoral rat-tail 111
pectoralis, Albatrossia 110
pectoralis, Chalinura 110
pectoralis, Coryphaenoides 110
pectoralis, Coryphaenoides (Nematonurus) 110
pectoralis, Dolloa 110
pectoralis, Nematonurus 110
Peje palo 337
Peje rata 210
Pelagic cods 318
Pentiki 65
peregrinus, Physiculus 371
periscopus, Gadus 75
pertusis, Merlangus 61
Peruvian grenadier 270
Pescada 336,337,340, 341
Pescada branca do Cabo 336
Pescada de Angola 342
Pescada de la Patagonia 339
Pescada de los canales 334
Pescada de ojo grande 356
Pescada do reino 336
Pescadilla 337,340
Pescadinha 340
pescadorus, Bregmaceros 16
Pesce fico 40
Pesce mudo 80
Peshk fik i bardhë 67
Peshk fik i zi 69
Peshk lakuriq 80
Peskadil'ia 57
Peterson's grenadier 310
petersonii, Macrurus (Macrurus) 310
petersonii, Ventrifossa 310
Petrosaloúlvardos 69
Phocaegadus megalops 26
Phycis 65
Phycis americanus 83,88
Phycis blennoides 66

Phycis borealis 88
Phycis brésilien 82
Phycis chesteri 67
Phycis chuss 83
Phycis de Floride 86
Phycis de fond 67
Phycis de roche 68,69
Phycis dekayi 88
Phycis filamentosus 83
Phycis furcatus 66,68,88
Phycis limbatus 68
Phycis marginatus 83
Phycis mediterraneus 68
phycis, Phycis 68
Phycis phycis 68
Phycis punctatus 87
Phycis ranina 73
Phycis regalis 87
Phycis tacheté 87
Phycis tenuis 88
Phycis tinca 66
Physiculus 370
Physiculus argyropastus 370
Physiculus bachus 373
Physiculus barbatus 374
Physiculus capensis 370
Physiculus chigodarana 370
Physiculus coheni 370
Physiculus cynodon 370
Physiculus dalwigkii 371
Physiculus fulvus 370
Physiculus grinnelli 370
Physiculus helenaensis 370
Physiculus huloti 370
Physiculus japonica 370,372
Physiculus karrerae 370
Physiculus kaupi 370
Physiculus longicavis 370
Physiculus longifilis 370
Physiculus luminosa 370
Physiculus marginatus 356
Physiculus marisrubri 370
Physiculus natalensis 370
Physiculus nematopus 370
Physiculus nigrescens 370
Physiculus nigripinnis 371
Physiculus normani 371
Physiculus peregrinus 371
Physiculus (Pseudophycis) bachus 373
Physiculus rastrelliger 371
Physiculus rhodopinnis 371
Physiculus roseus 371
Physiculus sterops 371
Physiculus sudanensis 371
Physiculus talarae 371
Physiculus therosideros 371
Physiculus yoshidae 371
Physis de fond 66
Pichelim 62
Piksha 55
pinnatus, Lyconus 322
piriei, Cynomacrurus 223
Plainfin grenadier 299
Plamcak 55
platorhynchus, Coelorinchus 138
Plegonero 56,57
Plouse 79
Podonema longipes 363
Podonematichthys longipes 363
Polaca 60,61
Polar cod 27,29
Polardorsch 29
polaris, Boreogadus 27
polaris, Merlangus 27
polaris, Pollachius 27
Polartorsk 29
Pollachius 69
Pollachius carbonarius 71
Pollachius chalcogrammus 75
Pollachius chalcogrammus fucensis 75
Pollachius linnei 70
pollachius, Merlangus 70
Pollachius polaris 27
pollachius, Pollachius 70
Pollachius pollachius 70
Pollachius typus 70
Pollachius virens 71
Pollack 70,71
Pollak 71
polli, Merluccius 341
polli, Merluccius merluccius 341
Pollock 72
polylepis, Merluccius 332
polylepis, Merluccius gayi 332
polylepis, Nezumia 263
polymorphus, Gadus 58
Ponticos 67
Pontikópsaro 65
Poor cod 80
Popeye grenadier 207,208
potassoa, Gadus 61
Potassolo 62
potronus, Macruroplus 309
Poulamon 59
Poulamon de l'Atlantique 58
Poulamon du Pacifique 58
Poule de mer 79
Pout 79
Poutassou 62
poutassou, Boreogadus 61
poutassou, Gadus 61
poutassou, Micromesistius 61
Pouting 79
productus, Coelorinchus 179
productus, Merluccius 342
profundicolus, Coryphaenoides (C.) 201
propinqua, Nezumia 280
propinquus, Lionurus 280
propinquus, Nezumia 280
Prosfygaki 62
proxima, Morrhua 58
proxima, Nezumia 281
proximus, Lionurus 281
proximus, Microgadus 58
proximus, Nezumia 281
pruinosa, Morrhua 58
pruinosus, Gadus 58
pseudoparallelus, Coelorinchus 139
Pseudophycis 373
Pseudophycis bacchus 373

Pseudophycis bachus 373
Pseudophycis barbata 374
Pseudophycis breviuscula 375
Pucinca 62
pudens, Macruroplus 282
pudens, Nezumia 282
Pugnose grenadier 269,289
pulchella, Lionurus (Nezumia) 282
pulchella, Nezumia 283
pumiliceps, Sphagemacrurus 288
punctata, Morhua 44
punctatus, Auchenoceros 355
punctatus, Bregmaceros 355
punctatus, Gadus 87
punctatus, Phycis 87
purpureus, Gadus 71
purpureus, Merlangus 71
Putassu 62
Putasu 62
pygmaeus, Gadus 42
Pyjoreapyrstoinen 65

Q

quadricristatus, Coelorinchus 138
quadripennatus, Coryphaenoides (Coryphaenoides) 220
Quincuncia 111
quincunciatus, Coelorinchus 138

R

radcliffei, Coelorinchus 138
Raniceps 73
Raniceps fuscus 73
Raniceps jago 73
Raniceps niger 73
Raniceps raninus 73
Raniceps trifurcatus 73
ranina, Phycis 73
raninus, Blennius 73
raninus, Gadus 73
raninus, Raniceps 73
raptor, Gadus 64
rarisquamosus, Bregmaceros 16
Rat tail 267
Ratón 151,210
Ratones 90
Rattail 307
Rattails 90
Rauhköpfiger Grenadierfisch 236
Rdzawiec 71
Red cod 374
Red codling 373
Red hake 83,84
regalis, Enchelyopus 87
regalis, Phycis 87
Regania 93
regia, Urophycis 87
Renacuajo de mar 377
rhacinus, Lotella 368
rhina, Antimora 354
Rhinonemus caudacuta 38
Rhinonemus cimbrius 38
rhipidodorsalis, Ventrifossa 296
rhodochir, Laemonema 361
rhodopinnis, Physiculus 371
riali, Onus 339
Ribaldo 370
Ricardo 67
richardi, Sphagemacrurus 288
rissoi, Lepidion 366
robustum, Laemonema 361
Rock cod 367
Rock grenadier 219
roseus, Physiculus 371
rostrata, Antimora 354
Rough head whiptail 145
Rough scaled grenadier 203
Roughhead grenadier 236
Roughsnout grenadier 316
Roughtip grenadier 284
Roundnose grenadier 217,219
ruber, Gadus 44,339
rubescens, Lepidion 366
rudis, Coryphaenoides (C.) 201
rupestris, Coryphaena 217,235
rupestris, Coryphaenoides 217
rupestris, Gadus 44
rupestris, Macrourus 154,235
rupestris, Macrurus 217
rupestris, Macrurus (Coryphaenoides) 217

S

Saai 340
Saffron cod 34
Sagami grenadier 300
Sagami sokodara 301
Saida 72
saida, Boreogadus 27
Saika 29
saikaiensis, Ventrifossa 296
Saint pierre 55
Saithe 71,72
Salilota 376
Salilota australis 377
Salilota bovei 377
Salmonete preto 370
Salouvardas 69
Saqqaya 340
scabrus, Trachyrincus 316
scaphopsis, Coelorhynchus 181
scaphopsis, Coelorinchus 181
Schellfisch 55
Schelviskkuller 55
schmidti, Lepidion 364
sclerorhynchus, Lionurus (Nezumia) 284
sclerorhynchus, Macruroplus 284
sclerorhynchus, Macrurus 210
sclerorhynchus, Nezumia 284
scotica, Brosmius 29
Seehecht 340
Seelachs 72
Sei 72
sellai, Onos 50
semiquincunciata, Nezumia 263
semiscaber, Coryphaenoides (C.) 201

senegalensis, Merluccius 343
senegalensis, Merluccius merluccius 343
Senegalese hake 343
sentipellis, Trachonurus 290
septentrionalis, Gaidropsarus 33
septentrionalis, Onos 33
serratus, Coryphaenoides 264,284
serratus, Macruroplus 264
serratus, Macrurus 264
Serrulate rattail 220
Serrulate whiptail 219
serrulatus, Coryphaenoides 219
serrulatus, Coryphaenoides (Coryphaenoides) 219
serrulatus, Macrurus (Coryphaenoides) 219
sexradiatus, Coelorinchus 138
sey, Gadus 71
Shallow water hake 336
Shibbut albin 62
Shibbut guz 80
Shore rockling 50,51
Short tail grenadier 281
Shortbeard grenadier 267
Shoulderspot grenadier 181
Shovel nose rattail 150
Shovelnose grenadier 149
sibogae, Coryphaenoides (C.) 201
Silver hake 334,335
Silver whiptail 142
Silvery pout 39
sinuatus, Merlucius 339
Six band grenadier 159
Skaegtorsk 79
Skaelbrosme 67
Skaggtorsk 79
Skellbrosme 67,78
Skjeggtorsk 79
Skrei 47
Slender cod 361
Slender codling 360
Slendertail grenadier 247
Slimehead grenadier 305
Smalleye moray cod 383
Smallhead moray cod 382
Smalltooth grenadier 276
smiliophorus, Macrurus 264
smiridus, Merluccius 339
smithi, Coelorinchus 138
Smooth grenadier 274,275
Softhead grenadier 242
Soroi hige 179
Sortmund 62
Sortvels 74
Southern bastard codling 374
Southern blue whiting 60
Southern codling 86
Southern hake 87,332
Spaerling 78
sparsilepis, Coelorinchus 138
Spearnose grenadier 174
Spearsnouted grenadier 168
Spectacled grenadier 279
Sphagemacrurus 287
Sphagemacrurus decimalis 288
Sphagemacrurus gibber 288
Sphagemacrurus grenadae 289
Sphagemacrurus hirundo 288
Sphagemacrurus pumiliceps 288
Sphagemacrurus richardi 288
Sphagemacrurus trichiurus 270
Spinaker grenadier 307
spinifer, Coelorinchus 138
spinosa, Nezumia 263
Spiny grenadier 178
spongiceps, Bathygadus 94
Spotted codling 87
Spotted hake 88
Squirrel hake 84
Sredizemnomorskiy trekhusiy nalim 51
Steenbolk 79
stegidolepis, Nezumia 286
Steindachneria 345
Steindachneria argentea 345
stelgidolepis, Lionurus 286
stelgidolepis, Lionurus (Nezumia) 286
stelgidolepis, Nezumia 286
sterops, Physiculus 371
Stintdorsch 78
Stokkafixx 62
Stokvisch heek 340
Strap tail 324
striatissimus aeger, Hymenocephalus (H.) 230
striatissimus hachijoensis, Hymenocephalus (H.) 230
striatissimus, Hymenocephalus (H.) 230
striatissimus torvus, Hymenocephalus (H.) 230
striatulus, Hymenocephalus (H.) 230
striaturus, Coryphaenoides (C.) 201
Strinsia tinca 359
Striped whiptail 158
stroemii, Macrourus 217
Sturgeon grenadier 246
suborbitalis, Macrurus (Nematonurus) 205
suborbitalis, Nematonurus 205
subserrulatus, Coryphaenoides 220
sudanensis, Physiculus 371
suilla, Nezumia 263
Sukeso dara 76
sulcatus, Bathygadus 94
sulcatus, Macrurus (Malacocephalus) 290
sulcatus, Trachonurus 290
Sumidara 353
Surgeon grenadier 139
svetovidovi, Tripterophycis 378
Swordsnout grenadier 176

T

Tabinja bjaltica 67
Tabinja mrkulta 69
Tacaud 62,79
Tacaud commun 79
tacaud, Gadus 80
Tacaud norvégien 77,78
Tadpole codling 377
Tadpole fish 73
Taiwan sokodara 159
talarae, Physiculus 371
talismani, Coelorhynchus 168
talismani, Coryphaenoides (Coelorhynchus) 168
talismani, Macrurus (Coelorhynchus) 168

Taoúki 57
Tasmanian codling 357
Tenaga dara 171
Tengu hige 180
tenuicauda, Mataeocephalus 247
tenuis, Hymenocephalus (H.) 230
tenuis, Phycis 88
tenuis, Urophycis 88
tenuis, Urophycis (Emphycis) 88
thelestomus, Coryphaenoides (C.) 201
Theragra 74
Theragra chalcogramma 75
Theragra chalcogramma chalcogramma 75
Theragra finnmarchica 76
Theragra fucensis 75
therosideros, Physiculus 371
Thickbeard grenadier 221
thompsoni, Coelorinchus 138
Thorntooth grenadier 232
Three bearded rockling 51
Three bearded rockling 52
Thumb grenadier 283
Tikhookeanskaya treska 44
Tinca marina 68
tinca, Phycis 66
tinro, Nezumia 263
toi, Nezumia 263
Tojin 163
tokiensis, Coelorinchus 138
tomcod fuscus, Gadus 58
tomcod luteus, Gadus 58
tomcod, Microgadus 58
tomcod mixtus, Gadus 58
tomcodus, Morrhua 58
tomiyamai, Nezumia 263
Toothed whiptail 232
Torsk 31,47
torsk, Blennius 29
torsk, Gadus 29
torvus, Hymenocephalus (H.) striatissimus 230
tosaensis, Lotella 368
Trachinoides maroccanus 339
Trachonurus 290
Trachonurus asperrimus 290
Trachonurus sentipellis 290
Trachonurus sp. A 290
Trachonurus sp. B 290
Trachonurus sp. C 290
Trachonurus sulcatus 290
Trachonurus villosus 290
trachyrhynchus, Macrurus 316
trachyrhynchus, Trachyrhynchus 316
Trachyrhynchus trachyrhynchus 316
TRACHYRINCINAE 312
Trachyrincus 313
Trachyrincus anonyme 316
Trachyrincus helolepis 315
trachyrincus, Lepidoleprus 316
Trachyrincus longirostris 313
Trachyrincus murrayi 313
Trachyrincus scabrus 316
Trachyrincus villegai 317
Tredadet havkvabbe 52
Treska 47
trichiura, Nezumia 270
trichiurus, Macrurus 270
trichiurus, Lionurus (Nezumia) 270
trichiurus, Sphagemacrurus 270
tricirrata, Motella 51
tricirratus, Gadus 50,51
tricirratus, Gaidropsarus 51
tricirratus, Onos 51
Trident 73,74
Trident grenadier 209
trifurcatus, Blennius 73
trifurcatus, Raniceps 73
trifurcus, Gadus 73
triocellatus, Coelorinchus 138
Tripendesh 62
Tripterophycis 378
Tripterophycis gilchristi 378
Tripterophycis intermedius 378
Tripterophycis svetovidovi 378
Trisopterus 77
Trisopterus esmarkii 77
Trisopterus luscus 79
Trisopterus minutus 80
Trisopterus minutus capelanus 80
Trisopterus minutus minutus 80
trowbridgii Homalopomus 34
Tusk 29,31
Tutchuelak 65
Twelve rayed grenadier 271
Two barred whiptail 147
tydemani, Coryphaenoides (C.) 201
Tylppapyrstoinen molva 64
typus, Pollachius 70

U

Ugorova majka pecatica 52
Ugotica 62
Ugotica mala 80
Ugotica srebrenka 40
Unicorn cod 17
Unicorn grenadier 179
Uraleptus maraldi 358,359
uraleptus, Merlucius 359
Urophycis 81
Urophycis brasiliensis 82
Urophycis chuss 83
Urophycis cirrata 85
Urophycis earllii 85
Urophycis (Emphycis) tenuis 88
Urophycis floridana 86
Urophycis regia 87
Urophycis tenuis 88

V

Vaillant's grenadier 95
vaillanti, Bathygadus 95
vaillanti, Coelorhynchus 168
variabilis, Coryphaenoides 205
Varlet 57
velifer, Coelorinchus 138
ventralis, Nezumia 263
Ventrifossa 292

Ventrifossa atherodon 296
Ventrifossa (Atherodus) atherodon 296
Ventrifossa barbiger 274
Ventrifossa ctenomelas 297
Ventrifossa divergens 299
Ventrifossa fasciata 296
Ventrifossa fusca 296
Ventrifossa garmani 300
Ventrifossa japonica 296
Ventrifossa johnboborum 296
Ventrifossa longebarbata 296
Ventrifossa lucifer 296
Ventrifossa (Lucigadus) nigromaculata 309
Ventrifossa macropogon 301
Ventrifossa macroptera 303
Ventrifossa misakia 304
Ventrifossa mucocephalus 305
Ventrifossa nasuta 306
Ventrifossa nigrodorsalis 307
Ventrifossa nigromaculata 309
Ventrifossa nigromarginata 296
Ventrifossa ori 296
Ventrifossa petersonii 310
Ventrifossa rhipidodorsalis 296
Ventrifossa saikaiensis 296
Ventrifossa (Ventrifossa) ctenomelas 297
Ventrifossa (Ventrifossa) occidentalis 243
ventrilux, Coelorinchus 182
verecunda, Laemonema 361
vermicularis, Coelorhynchus 174
vernalis, Merlangus 61
vertagus, Gadus 44
Viakwater stokvis 336
villegai, Trachyrincus 317
villosus, Trachonurus 290
viola, Haloporphyrus 354
violaceus, Macruroplus 243,284
violaceus, Macrurus 284
virens, Merlangus 71
virens, Pollachius 71
viridis, Gadus 70
Vitling 57
Vorschkval 74
vulgaris, Brosmius 29
vulgaris, Gaidropsarus 49,51
vulgaris, Lota 53
vulgaris, Merlangus 56
vulgaris, Merluccius 330,334,339
vulgaris, Molva 64
vulgaris, Morhua 44
vulgaris, Motella 51
vulgaris obensis, Lota 53
vulgaris, Onos 51

W

wachna, Gadus 34
Walleye pollock 76
weberi, Coelorinchus 138
Western Atlantic grenadier 265
Western softhead grenadier 243
Whiptail 327
Whiptails 90
White hake 88,89
Whiting 56,57,343
Whitson's grenadier 238
whitsoni, Coryphaenoides 238
whitsoni, Macrourus 238
Wijting 57
Witlinek 57
Witte koolvis 71
Wittling 57
woodmasoni, Coryphaenoides (C.) 201

Y

yaquinae, Coryphaenoides (N.) 201
Yari hige 175
yarrellii, Laemonema 361
Yoroi sokodara 239
yoshidae, Physiculus 371
Ysa 55
Yumi katadara 98
yuvto, Laemonema 361

Z

zaniophorus, Cariburus 221
zaniophorus, Coryphaenoides 221
zaniophorus, Coryphaenoides (Coryphaenoides) 221
Zeepuitaal 32
zugmayeri, Melanonus 318
Zunaga sokodara 170

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